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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Sulphate Prices and Problems

THE annual report of the British Sulphate of Ammonia Federation, some extracts from which are published in this issue, disposes at once of any hope of increased prices for sulphate of ammonia. On the contrary, to quote from the report, "there is every indication that the average price of sulphate for 1925-26 will be substantially lower than for the year under review." The average price for the past year was £12 5s. 6d. per ton (21·1 per cent. nitrogen) while the price five years ago was £23 15s. 3d. The causes assigned for the reduction are the economic pressure on Germany, the increase in the production of synthetic nitrogen in 1924-25, and the further large increase now taking place. On the other hand, the present low price is stimulating demand to an extent that would have been considered fantastic ten years ago. If no hope can be encouraged of any increase in price, there is at least a reasonable expectation that the expansion in demand will absorb the output of the new synthetic plants expected to start operation shortly in Italy, France, and Belgium, and of the extensions to existing plants in Germany and Great Britain.

While the decline in price is serious enough, there is another disquieting matter mentioned in the report, namely, the loss of orders to the extent of 49,000 tons in Japan, one of Great Britain's best customers. This is attributed to the tendency of powdery neutral sulphate to cake—a fact which, it is stated, has caused very considerable inconvenience both at home and abroad. The drop in exports to Japan from 85,000 tons in 1923-24 to 36,000 tons in 1924-25, owing to the inferior condition of British sulphate, is naturally regarded as serious, and the Federation has appointed a technical committee to inquire into the causes of caking, which is the chief point at issue. In view of the almost revolutionary improvements which have been effected in the chemical properties of sulphate of ammonia during the past ten years, it is certainly discouraging to find the present day salt failing to satisfy customers on account of a physical property which, prior to the war, never entered into the reckoning. There is no doubt, however, that new standards are being set; and, as we have so often pointed out, the by-product ammonia producer now finds his criteria established by the synthetic manufacturers, who, from the point of view of purity of products, have everything in their favour. The progress made in connection with neutral salt has been an outstanding feature of the campaign of recent years towards improvement of quality, but it must be borne in mind that, above a certain minimum, the ammonia content of sulphate is not so important to its user as is the condition in which he receives it. The Federation has from time to time urged its members to strive after a uniform product, so that, as far as possible, sulphate produced in different parts of the country shall present a uniform appearance, but as yet it cannot be said that this has been achieved.

As to the most promising lines on which the problem may be attacked, some unusually helpful suggestions were recently made by Mr. A. D. Cummings in a paper read at Newcastle. Mr. Cummings pointed out that many difficulties in dealing with sulphate of ammonia would be lessened if the average size of the crystals was larger, and he drew attention to the view we advanced in December last to the effect that small crystals are formed by the cooling of the mother liquor after it leaves the saturator. Whatever the true causes, however, there can be little doubt that sulphate of ammonia suffers from the fact that it is produced in an apparatus which attempts to combine several operations in one. The saturator, which has undergone practically no change in design since it was first introduced, acts as an absorber, evaporator, and crystalliser; and, if the design is bad, little can be done to improve the size of grain. Mr. Cummings makes the rather sweeping assertion—and many will agree with him—that with the present type of plant it is difficult to see how the grain size can be materially

increased, although in many cases improvement can undoubtedly be effected by careful control of the saturator. We feel, in fact, that the main responsibility must be placed upon the saturator, and that it is with saturator conditions that more uniformity of operation is required. One finds, in fact, that nearly every individual producer has his own views as to such important items as the acidity of the bath, while there is little uniformity in structural design. If, then, consistency of both chemical and physical qualities is aimed at, it would seem that there is ample room for some systematic study of what is actually occurring within the saturator, so that standardised design and standardised operation could be determined and the information made available by the Federation for all sulphate manufacturers.

B.D.C. Reconstruction Terms

THE official statement issued by the British Dyestuffs Corporation last Saturday fully confirms the forecast of the position we published last week, but supplements it in several details. As regards the fundamental point—the cancellation of the existing arrangement with the Government—the terms of the agreement are that the Government terminate their existing rights of veto and control, forego their right to nominate two directors, and consent to the surrender of all their shares. In return the Corporation agree that a sum of £600,000 be paid to the Government in purchase of their holding, that no alteration be made in article 38 (1) providing that not more than 25 per cent. of the company's shares shall be held by foreigners, and that the company keep in touch, in all matters of technical research and information, with the Government in such manner as the President of the Board of Trade may direct.

The proposals for the reduction of capital are thorough and comprehensive. First of all, the book value of land, buildings, plant and machinery is to be reduced from £2,958,498 to £1,760,238. Stocks, standing in the books at £1,320,324, are reduced to £1,039,342. It is proposed to write off entirely the preliminary expenses, £251,552, goodwill, patents, and trade marks £750,000, and the adverse balance on profit and loss accounts £360,602. Of the cash assets of £3,894,207, £600,000 will be absorbed in the purchase of the Government's shares and £980,136 in a cash payment to the preference shareholders, making a total cash distribution of £1,580,136. The total capital, as the result of the company's proposals, will be reduced from £9,197,112 to £4,775,580. This will involve the cancellation of 850,001 preference shares and 850,000 preferred ordinary shares owned by the Government; the reduction of the remaining issued preference shares by 6s. per share; the reduction of the remaining issued preferred ordinary shares by one-third; the reduction of the issued deferred ordinary shares by two-thirds; and the consolidation of the several classes of issued shares—viz., preference, preferred ordinary, and deferred ordinary into one class of £1 ordinary shares. In practice this means that the preference shareholders (other than the Government) will receive 6s. in cash and 14s. in £1 ordinary shares for each preference share held; the preferred ordinary shareholders (other than the Government) will receive two-thirds of their present holding in £1 ordinary shares; and the deferred ordinary shareholders will receive one-third of their present holding in £1 ordinary shares.

The effect of this scheme will be to give the Corporation a new and much freer start, and to open up good prospects. The Board considers that the financial position of the company in regard to capital will undoubtedly be very sound, and that a large part of this capital will be represented by liquid assets, which will be available not only for the purpose of providing the plant and machinery required in connection with any new processes and inventions, but also for the purpose of enabling the company to engage in the manufacture of other products, whereby the resources, the equipment, and the trained personnel of the company's undertaking may be used to advantage. If the proposals are approved there will be no obstacles to the wider and more efficient use of the company's resources, although some time must necessarily elapse before definite results can be obtained. The Board therefore recommend the acceptance of the scheme to the shareholders, in the belief that it will not only add to the stability of the company's undertaking, but afford to those entrusted with its management a fair opportunity to make it a success. This estimate seems well within the limits of probability.

Chemical Diversity

PROFESSOR JOCELYN THORPE, at the joint chemical dinner in London last Friday, put up a delightful plea for a unity among chemical organisations that would leave things as diversified as ever. Co-operation, he allowed, might not be too bad; but amalgamation, involving the enthronement of a "chemical emperor"—this was really more than a joke. Could rational people, he seems to wonder, seriously expect the Chemical Society, with its pure and ancient lineage, to overlook the distinction between itself and such "mushroom growths"—a particularly happy and conciliatory term—as the Institute and the Society of Chemical Industry? Rather not. And as regards the American Chemical Society, with its 16,000 members and its 69 sections, why, each of those sections was a tail that might wag the dog, and no self-respecting dog liked to be wagged about in that undignified way. We do not know what view will be taken of this at the Cosmos Club or Mills Building in Washington, but in the corresponding British society the 19 or 20 tails have so far not succeeded in diverting the noble creature very far from the course it preferred itself Finally, the professor washed out the Piccadilly Circus or Salisbury Plain conception of a central chemistry house. Why not follow precedent? Let the Government, which originally gave the rooms in Burlington House for the Chemical Society, present the Museum of Practical Geology in Jermyn Street—famous for its collection of fossils—as a Central House for Chemistry? What could be simpler or more appropriate? Even Mr. Woolcock's unfailing resources seemed a little taxed in following so embarrassing a lead, and to bring the discussion round again to "the one big thing in chemistry" was almost a touch of genius.

Seriously, it was a pity. The occasion itself, the bringing of so many societies to dine together under one roof, was an ideal text and example. The arrangements were excellent, the company unusually representative, the dinner itself most satisfying, the music good, the atmosphere most friendly. One touch alone was needed to strike the united note, to which all were eager to respond. And the professor missed it.

University College Centenary

In connection with the approaching centenary of University College, London, an appeal has been issued for half a million to enable the College to start unhampered on its second century. The foundation stone of University College, we learn from the terms of the appeal, was laid in 1827, after two years of preparatory work following on a letter from Thomas Campbell published in *The Times* of February 9, 1825, in which the foundation of a University of London was first proposed. The object of the new university was to give education without regard to class or creed, and more particularly in a large number of new subjects, which did not at that period form part of the ordinary university curriculum. In the words of an early report, "it was for a class of sciences, the knowledge of which is not profitable to the possessor in a pecuniary point of view, but which exert a great influence on the well-being of society, that such an institution was required."

It is estimated that if this work is to continue, on the scale which the present century demands, a sum of at least £500,000 is urgently necessary. Of this total £225,000 is needed for the endowment of teaching. Other urgent needs are the provision of a great hall, the reconstruction and endowment of the libraries, and the completion of the engineering equipment. The laboratory teaching of engineering is one of many subjects in which University College has done pioneer work. The College was the first of that group of new universities that have now spread, not only through England, but to all parts of the Empire. Owing to its position as the oldest and largest college of the University of London, however, it must always carry peculiarly heavy obligations and responsibilities. The centenary of the College is in itself a notable educational landmark, and there could be no worthier form of celebration than the raising of an adequate fund for future maintenance and expansion. Donations of any amount may be sent to the honorary treasurer of the Centenary Appeal Fund (Sir Robert Kindersley), University College, London, from whom copies of the complete appeal may be obtained.

British Optical Glass

The tribute of the Director of Scientific Research to the Air Ministry to the high quality of British optical glass, following on the recent testimony of the Director of Scientific Research to the Admiralty, is distinctly reassuring. The Admiralty experience of optical apparatus made in this country, supported by tests in the laboratory and by trials under stringent service conditions, was that British optical instruments and glass are second to none. The Air Ministry, although concerned with a smaller variety of instruments, is a larger user of unit sights for guns and of camera lenses for photographic work. It has had occasion to compare the quality of instruments of this kind produced in this country with those made abroad, and its experience, like that of the Admiralty, is that no better quality of optical apparatus is obtainable than that manufactured in Great Britain. This should lay to rest one more of the popular misconceptions that have done so much harm to British products in the past.

The Calendar

1925 Nov 23	Royal Society of Arts (Cantor Lecture): "Coal Ash and Clean Coal" (Lecture I). Dr. R. Lessing. 8 p.m.	John Street, Adelphi, London, W.C.2.
23 to Dec. 5	Shipping, Engineering, and Machinery Exhibition	Olympia, London.
Nov 25	Institute of Chemistry (Belfast Section): "Alchemists and Chemists in Art and Literature." R. B. Pilcher. 8 p.m.	Central Hall, Municipal College of Technology, Belfast.
25	Institute of Physics—Public Lectures on Physics in Industry. No. 9. "The Physicist in Agriculture, with Special Reference to Soil Problems." (Illustrated). Dr. Bernard A. Keen. 5.30 p.m.	Burlington House, Piccadilly, London.
25	Society of Chemical Industry (Nottingham Section): "Migration of Alkali" (In Wool) or "Indicator-Dyed Wool." A. T. King.	Nottingham.
26	Chemical Society: Informal Lecture by Professor R. Robinson. 8 p.m.	Burlington House, Piccadilly, London.
26	Hull Photographic Society: "The Application of Photography to Science." J. Pryce-Jones. (Members of the Hull Chemical and Engineering Society invited to attend)	Grey Street, Park Street, Hull.
26	Institute of Chemistry and Society of Chemical Industry (Edinburgh Sections): "Fuel." J. W. Mitchley. 7.30 p.m.	Pharmaceutical Hall, 36, York Place, Edinburgh.
26	Institute of Chemistry Students' Association (London). Impromptu Debate. 8 p.m.	30, Russell Square, London.
26	Chemical Society: "Recent Researches on the Structural Relationships of Some Plant Products." Informal Lecture by Professor R. Robinson. 6 p.m.	Burlington House, Piccadilly, London.
26	British Cast Iron Research Association and the Institute of British Foundrymen (Birmingham and West Midlands Branch): "Foundry Training from apprenticeship to the Foundry Technical High School." Mons. E. Ronceray (Paris). 7.30 p.m.	Engineers' Club, Birmingham.
26	Society of Dyers and Colourists (Midlands Section): "Suggestions for the Dyeing of Natural and Artificial Silk Hosiery containing Cotton." H. D. Mudford.	Nottingham.
27	Institute of Chemistry and Society of Chemical Industry (Glasgow Sections): "The Heat Evolved during the Detonation of Explosives." W. G. Hiscock.	Royal Technical College, Glasgow.
27	West Cumberland Society of Chemists and Engineers: "Engineering Brasses and Bronzes." V. G. Stevens. 7 p.m.	Workington.
27	Institute of Chemistry and Society of Chemical Industry (South Wales Section): "A New and Rapid Method of Determining Sulphur in Petroleum Products." E. S. Squire.	Technical College, Swansea.

The Chemistry of Adhesive Substances.—(II)

By G. Malcolm Dyson, B.Sc., Ph.D., A.I.C.

In our last issue Dr. Dyson dealt with glues and gelatins and their chemical examination. He describes further tests, below, and in conclusion discusses casein adhesives and vegetable gums.

THE fusion point of a glue jelly is a useful means of testing the source and nature of a glue, and the Cambon fusiometer (Fig. 2) is a neat device for the determination of this value. It consists of a polished brass capsule (A) with a plane interior bottom surface on which stands the polished and silvered cylinder (B). The capsule is slightly conical and the diameter of the cylinder is equal to the smallest internal diameter of the capsule. The capsule itself must be massive enough to sink in water. The fusion point is determined by taking 10 gm. of the glue and 40 cc. of distilled water, and allowing the two

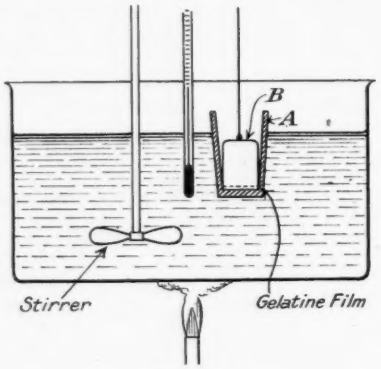


FIG. 2.

to stand together in a stoppered cylinder for 24 hours. The tube is then immersed in water at 70° C. until the glue is melted, after which it is shaken up to ensure homogeneity. The metal cylinder is warmed slightly, dipped in the glue solution and pressed into the capsule, pressure being maintained until the jelly has set. The whole is then suspended in a large beaker of water which is gradually heated. A thermometer graduated in tenths and an efficient stirring device are also immersed in the bath, and the temperature at which the capsule detaches itself and falls to the bottom of the bath is read off as the fusion point of the glue.

The fusion point of a good hide glue is 29-30° C. while that of a bone glue is 21-22° C. (*i.e.*, when in 20 per cent. aqueous solution). The effect of boiling on hide glue is shown in the following table, which indicates that the fusion point of a glue gives a guide to the variety under test :—

Period of boiling in hours	Fusion point
0	29° C.
0·5	28° C.
1·0	27·3° C.
1·5	26·75° C.
2·0	26·2° C.

Comparative values for the strengths of glues can be obtained by fusion point tests on the two samples. Suppose, for instance, it is desired to compare the sample A with a standard sample B. Then a fusion point is determined for a 20 per cent. solution of A (α_1) on a 20 per cent. solution of B (β_1) and also on a 25 per cent. solution of B (β_2). The values β_1 and β_2 need only be determined once and for all for the standard glue. From this data the " glue index " (x) is worked out by means of the purely empirical expression :—

$$x=\frac{5(\alpha_1-\beta_1)}{(\beta_2-\beta_1)}$$

To take an example :—

1. A 20 per cent. solution of sample A has an F.P. (α_1) = 23·3 C.
2. A 20 per cent. solution of sample B has an F.P. (β_1) = 21·2 C.
3. A 25 per cent. solution of sample B has an F.P. (β_2) = 22·6 C.

Then :—

$$x=\frac{5(\alpha_1-\beta_1)}{(\beta_2-\beta_1)}=\frac{10\cdot5}{1\cdot4}=7\cdot5.$$

from which it is taken that $20+x$ (*i.e.*, 27·5) lb. of the glue B are equivalent to 20 lb. of the glue A.

The " gold number " serves rather to distinguish glue and gelatin adhesives from other glutinous preparations, than to discriminate between glues of different classes. It is taken in practice to be the number of milligrams of colloidal substance that just fails to prevent the colour change from red to violet in 10 c.c. of a specially prepared gold sol, caused by 1 c.c. of 10 per cent. sodium chloride. The special gold sol is made up by adding 2·5 c.c. each of 0·6 per cent. " gold chloride " (hydrochloroauric acid) solution, and 0·18 N potassium carbonate solution to 120 c.c. of distilled water, boiling and rapidly adding 3·5 c.c. of a very dilute solution of formaldehyde (containing 3 c.c. of the 40 per cent. solution in 1,000 c.c. of water). The method of testing needs no description. Gold numbers of various substances are :—

Substance.	Gold number.
Gelatin	0·005– 0·01
Russian glue	0·005– 0·01
Isinglass	0·01 – 0·02
Egg albumen	2·5 – 3·0
Dextrin	6·0 –20·0
Starch paste (potato)	25·0

It may be mentioned that a rapid method of identifying gelatin or agar-agar in foodstuffs such as fish-paste, sausages, etc., is to make a thin smear preparation on a microscope slide, and to stain with thionin blue, when the gelatine is seen as clear blue patches, while the agar appears violet. A larger sample can be extracted with warm water and the gelatin precipitated by the gradual addition of alcohol to the filtered extract. The precipitate can be dissolved in hot water and tested for the presence of gelatin by means of tannin.

Mechanical Strength Tests

Tests for mechanical strength in glue may be divided into two classes : those which test an actual glued join, and those which test the glue gel. The latter tests are performed with an instrument known as a " gelometer," which is often complicated both in design and action, and which does not give easily interpretable data. It usually depends for its action on the weight (which is increased at a predetermined constant rate) which is required to force a cylinder of metal through the surface of a standard gel.

The tests on actual wood joins are more satisfactory, and have been taken as the basis of the British Standards for aeronautical materials. The method, in outline, is to split a piece of wood longitudinally into halves, to glue it together, and to dry the join under standard conditions. The joint is then pulled apart in a special machine, where the breaking strain can be measured by means of a dynamometer. The tests must, of course, be performed under strictly comparable conditions with regard to the grain and nature of the wood, etc. The British Standards are :—

Glue.	Breaking strain.	Use.
Propeller	1,100 lb./sq. in.	Aeroplane propellers.
Class I	1,000 lb./sq. in.	Stress bearing work.
Class II	900 lb./sq. in.	Work carrying no stress.

Modifications of the test have been devised for measuring the strength of weaker adhesives. In the Schopper apparatus strips of paper impregnated with the adhesive (under comparable conditions) are torn apart, the strain at parting being considered proportional to the strength of the adhesive. Examples of results obtained on the Schopper machine are :

Fine glue	6·52
Glue	5·75
Gum arabic	4·69
Gum. Trag.	4·01
Dextrin	3·56
Paper alone	3·50

The use of glue and gelatin occupies a large place in the manufacture of adhesives, and their colloidal nature is taken advantage of in sizing, electro-plating (where the addition of gelatin to the bath produces an even coherent deposit of the metal), the preparation of emulsions, photographic films,

papers, etc., and in the manufacture of various forms of foodstuffs.

Casein

Casein is the basis of a large number of waterproof adhesives and cold glues, as well as of such foodstuffs as farina and semolina. Several methods are available for its preparation from milk, but in every case the milk must be fat-free. To obtain the milk in this condition it is centrifuged at a very high speed The methods of coagulation may be divided into three groups

1. Coagulation with mineral acids.
2. Coagulation with vegetable acids.
3. Coagulation with rennin.

The acid most commonly used is sulphuric acid, although hydrochloric acid can be used with equal success. The advantage of sulphuric acid lies in its cheapness, but it precipitates the calcium salts in the milk, with the result that the casein contains calcium sulphate as an impurity.

The degreased milk is heated to 40-45° C., and gently stirred while a quantity of 10 per cent. sulphuric acid corresponding to 0·25 to 0·75 per cent. of acid in the whole (according to the richness of the milk) is run in. After stirring for a few minutes the vats are covered and the liquid allowed to stand, when the casein curd rises to the top. It is removed by perforated wooden shovels, and centrifuged, by which the liquid contents are reduced to 25 to 30 per cent. The curd is now washed and recentrifuged, and finally dried. The drying must be done rapidly, so that the curd preserves a good colour. Drying is usually done by heating on aluminium wire trays to 35°-40° C. in vacuo.

The value of the casein depends largely on the colour, and the size of the granules, which in turn depends on the precipitating agent used, so that various precipitants have been tried with a view to improving these qualities. Lactic and acetic acids have been found successful, although for commercial work the former is rather costly. They give a better-coloured and finer-grained product than either sulphuric or hydrochloric acids.

The third group of methods consists in curdling the milk by means of rennin, or bacterial ferments. The rennin of the calf's stomach is the most used, and is contained in the form of a zymogen in the gastric mucosa from which it is liberated by the acid of the stomach. The clotting action is dependent on the presence of calcium salts in the milk, and consists of the conversion of the soluble caseinogen into a soluble protein allied to casein (paracasein) which is then converted to a clot of casein by the action of the calcium salts.

Casein is a conjugated phospho-protein, possessing several peculiar properties. It is not coagulated by heating, but is

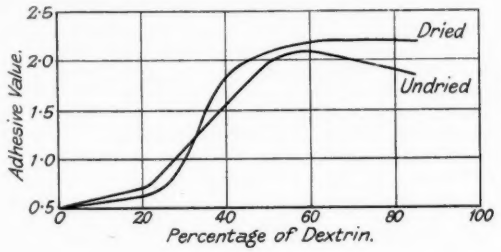


FIG. 3.

precipitated from faintly acid solutions, although it goes into solution again as the amount of acid increases. Its hydrolysis products contain eighteen or more different amino-acids, including a remarkably high percentage of tryptophane and cystein.

The commercial product is of a white or pale cream colour, and contains about 8 to 12 per cent. of water. A pale yellow colour or brownish tinge either indicates very careless preparation or adulteration with cheaper materials. There should be no trace of rancidity about it, but a faint "cheesy" smell, and the fat content should be low, since 1 per cent. of fat renders it unfit for use. It is worth mentioning that, owing to the degree to which the fat is entrained amongst the protein matter, the usual extraction methods for fat estimation give values which are too low. The method devised by Polenske of treating the material with 30 per cent. sulphuric acid to remove the protein before extraction of the fat is more satisfactory. The ash should be less than 5 per cent. and free acid should be absent.

A large number of formulæ are used for the preparation of glues from casein, the essentials being casein with some sort of mild alkali and a preservative, e.g.:

Casein	78·0
Sodium carbonate	4·5
Sodium fluoride	4·0
Lime	12·5
Sodium arsenate	1·0

The ingredients are rubbed to a fine powder and moistened with water. Other formulæ employ agar-agar, sodium silicate, borax, gum arabic, etc. The disadvantage of the casein glues is that they must be used soon after wetting, but they have the merit of using cold water, and giving a very strong joint. They are waterproof, and for this reason find a use in the manufacture of the various "plywoods" used in joinery. For this purpose a glue consisting of casein and calcium tannate mixed with ammonia water is used, and is reputed to be entirely impervious to water.

Dextrin provides a cheap and serviceable adhesive for the gumming of paper articles such as labels, envelope flaps, and the like. It is obtained by heating starch with dilute acid at a fairly high temperature. The concentration of nitric acid which has been found very suitable for this purpose is 0·3-0·5 per cent., and the heating is continued for about two hours at 120°-140° C. After such treatment the paste contains about 75-80 per cent. of dextrin and can be used straight away or dried. The paste used without drying seems less efficacious than that which has been dried and remade into paste. The adhesive-percentage curves (Fig. 3) show this falling-off in the value of the raw paste at high concentrations of dextrin. A starch glue can be made by heating starch with an aqueous solution of phenol or calcium phenate, but it has no advantage over that prepared in the more usual way.

The Vegetable Gums

Being unprepared natural products, the vegetable gums are of a more or less indeterminate chemical structure, and are not particularly amenable to chemical treatment or identification. They are more liable to adulteration than any other commercial commodity since there is considerable difficulty in chemically recognising and estimating such adulteration.

The gums which are of primary interest to the adhesive manufacturer are the various species of gum acacia and gum tragacanth. The two principal varieties of gum acacia are gum Arabic and gum Senegal, the others (Cape and Indies gum) being very inferior and used only for purposes of adulteration. The active principle of these gums is arabin, the calcium salt of arabic acid. Pure arabin is a white, odourless substance which is lævorotatory in solution, and which does not reduce Fehling's solution. Its solution froths on shaking.

The gum Arabic comes from various districts in Arabia *via* Aden, and many varieties are recognised in commerce. The best is "Cordofan," a clear gum in pieces about 2 cm. in diameter and of a very pale colour; a good quality gum is the "Sennar," which is smaller and yellower, while inferior brands, such as Geddah and Mogador, are dark and difficultly soluble. Whatever the source of gum Arabic it always contains a catalase enzyme which gives a blue-green colour with guaiacum tincture, and produces various colour reactions with phenols and amines, which serve to identify the gum:—

Pyrogallol	Reddish
Guaiacol	Brown
Acetyl guaiacol	Reddish brown
Cresol	Yellow-orange
α-Naphthol	Blue-lilac
α-Naphthylamine	Blue

The action of nitric acid on gum Arabic gives mucic acid.

Gum Senegal, of which fifteen varieties are recognised in commerce, differs from gum Arabic in several important particulars. It is, like gum Arabic, easily soluble in water, but with nitric acid it gives a nitro-compound, and on destructive distillation gives aceto-propione.

Gum Arabic is purified by solution in water, bleaching with sulphur dioxide and clarification, after which the clear solution is evaporated. The adulteration of gum Arabic is a widespread and flourishing business, and, apart from the dilution of good gums by inferior parcels, substances such as dextrin, ersatz, bdellium, etc., are often found, together with fruit tree gums

(cherry, plum, etc.). Microscopic examination will often reveal identifiable fragments of the cortex of the tree, while solubility tests will reveal the presence of insoluble gums. Pure gum Arabic should yield no precipitate with a basic lead acetate solution. The presence of bdellium can be detected by the greenish colour and sticky touch of the pieces, and also by dry distillation when the presence of ammonia in the distillate indicates with reasonable certainty the presence of this substance.

Bassorin or cerasin from fruit gums can be "spotted" by the following test: 40 gm. of the gum is dissolved in 500 c.c. of distilled water, when gum Arabic alone dissolves. The residue is boiled with 10 per cent. caustic soda solution when cerasin dissolves and can be obtained from the solution by treating the filtered liquid with glacial phosphoric acid and an equal volume of alcohol. The presence of a flocculent precipitate indicates cerasin. A microscopic examination will identify bassorin in the residue from the alkaline extraction.

The presence of dextrin in vegetable gums can be detected by adding a few drops of the following freshly prepared solution, when a blue colour indicates the presence of dextrin:—

Distilled water	100 c.c.
Ferric chloride (pure)	2 gm.
Potassium ferricyanide	2 gm.
Hydrochloric acid	8 drops

Gum tragacanth is the only remaining adhesive gum which demands notice. It is easy to differentiate from the acacia gums, being difficultly soluble in water, a 1 per cent. solution being cloudy and giving a dense precipitate with lead subacetate solution, while in contradistinction to gum Arabic it gives no precipitate with ferric chloride solution.

The uses of gums acacia and tragacanth are mainly for the manufacture of paper adhesives, and for binding solutions in the confectionery trade. The solutions in water, however, need the presence of a preservative to keep them from the growth of moulds. The choice of a preservative requires care, since it must be mild enough not to spoil delicate paper (e.g., photographic paper) and must be strong enough to act as a fungicide, and must not cause discoloration of the mucilage with age. Oil of cloves and zinc chloride are the commonest preservatives. Thymol has been used, but evaporates too quickly.

Research Workers in Industry

The Problem of their Utilisation

At a meeting of the Institution of Chemical Engineers held in the hall of the Institution of Mechanical Engineers, Westminster, on Thursday evening, November 12, a report of the Research and Inventions Committee of the British Science Guild on the present position with regard to the supply of trained scientific workers and their utilisation in industry, issued in June last, was the subject of discussion. Sir Frederic Nathan (President of the Institution) was in the chair.

Major Fletcher Moulton, in opening the discussion, said that it was very cruel kindness to induce people to train themselves as research workers if there was going to be no market for them. A table in the report showed that since the war there had been an increase of something like 60 per cent. in the number of full-time students in science and technology at those universities and university colleges which were in receipt of Treasury grants in the year 1913–14. Including Oxford and Cambridge the students in 1923–24 numbered practically thirteen thousand. Another table showed that the ratio to population of science and technology students in Great Britain was no greater now than it was in Germany and the United States before the war. Whereas full-time research students had greatly increased, there had been a falling off in part time, post-graduate, and research students. In most departments the demand for research workers was not keeping up with the extra supply—in chemistry there was a special warning that the demand was not at all equalling the supply. This did not mean that a well-equipped man was going to be left doing nothing; but it did mean that a man who might have been a valuable research worker would have to move off to routine work or teaching or something else, where he could not utilise his special qualifications. Millionaires did not grow as freely here as in the United States, and it was to millionaires that research must look for good endowments. One difficulty about fundamental research was that after the collection of facts publicity was the natural sequence; and publicity could not be combined with the protection given by the Patent laws. Those who subsidised fundamental research realised that they were giving to the world the results of their own expenditure without getting anything themselves. In some cases it might pay the State to assist research without asking for the results to be published for, say, five or six years. As to how far a university training could be combined with a really practical acquaintance with works and factories, in engineering this was largely done; and it would be interesting to know how far that could be extended to the chemical industry.

Practical Acquaintance with Works

In a discussion that followed Professor F. G. Donnan said that his experience in the Chemical Department at University College was that the really brilliant men, who combined with knowledge firmness of character and certain other qualities, were obviously wanted by everybody. But such men were only a small proportion of the whole. There was a great middle class of good men who were not remarkably brilliant, and the great majority of these had got posts since the war. Of the other men some had gone into secondary school teaching; not many of them had failed to get employment. He did not think there was an over-production of chemists. The difficulty with the universities was that they had not enough money available for the apparatus and equipment necessary for research. Anything that kept the higher technical schools and universities away from the closest possible touch with industry was bad for the country and worse for the schools and universities.

Professor Smithells said that in the earlier days of his scientific life he was very much interested in flame, and pursued the subject with a lofty detachment from all things mundane. Presently he was invited to talk to industrialists on the subject. Gas engineers in particular became very much interested and in the end the gas industry established a department which was concerned with fuel in general and the coal gas industry in particular. At the same time the industry had appointed a general committee of its own members associated with an equal number of scientific representatives of the University of Leeds.

Sir Robert Robertson said that in the Massachusetts Institute of Technology, where they had a graduate course in pure chemistry, they sent chemists in batches under the charge of an assistant professor to works in the neighbourhood, and there was great co-operation between the students and the managers of the factories.

Apprentice Student or University Man

Mr. T. M. Davidson said that it was not a rare thing to hear a man who was really competent to speak on the subject say that the apprentice student was more useful to him than the university type. Were the universities turning out men equal to the needs of industry? Notwithstanding the fact that the research worker was highly trained, he was turned out at the age of twenty-one years or over with an appalling lack of workshop knowledge and experience which placed him at a disadvantage at once.

Mr. H. T. Tizard said it was rather difficult to balance the supply and demand of research workers. His experience was that there was too much supply in some directions and too little in others.

Mr. A. J. V. Underwood said the report showed that the average expenditure of an industry upon research was in the neighbourhood of sixty pounds a year from each firm in an industry where there was a research association. Approximately it was the cost of an office boy—slightly less than the cost of a labourer. They might imagine the board of directors sitting down to discuss whether they should join a research association or employ an additional office boy.

Dr. Geoffrey Martin said there was a cause which, if they waited long enough, would disrupt any research association. When the big firms found themselves contributing, say, 70 per cent. of the cost of the association, they would contrive to get rid of the small firms so that the whole benefit of the research work should go to themselves.

Chemical Trade Returns for October

Exports Down on Last Year's Figures, but Up on September Totals

IMPORTS of chemicals, dyes, drugs and colours (excluding mercury) for October totalled £1,161,123—a decrease of £84,793 on October of 1924, but an increase on September of this year of £202,721. Exports are valued at £2,088,745, which is a decrease of £483,684 as compared with October last year, but an increase of £275,377 on the figures for September this year.

Some important changes are included in the following detailed statistics. On the import side there have been marked increases in the figures for tartaric acid, distilled glycerin, and ground barytes. Potassium nitrate values are more than doubled. There is a drop from 1,225 cwts. to 200 cwts. in the case of crude glycerin, and alizarine figures are not a tenth of last year's results for the month; other dyestuffs materials are also down.

On the export side, sulphate of ammonia maintains its aggregate results, but the markets are changing considerably. Spain and Italy are increasing their demands, and Japan has practically doubled her figures. France and the Dutch East Indies are taking much less. Several coal tar products show marked improvement. Barytes has jumped from 843 cwts. to 6,816 cwts., but white lead, sodium carbonate, and sulphuric acid are down.

Imports

	Quantities. Month ending October 31.		Value. Month ending October 31.	
	1924.	1925.	1924. £	1925. £
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Acetic .....tons	1,126	912	49,887	38,913
Acid Tartaric .....cwt.	986	4,929	5,206	18,100
Bleaching Materials ,,	8,751	10,853	9,005	10,179
Borax ..... ,,	6,717	7,784	8,152	8,929
Calcium Carbide .. ,,	89,787	79,414	62,830	55,325
Coal Tar Products not elsewhere specified value	—	—	18,856	3,562
Glycerin, Crude....cwt.	1,225	200	3,016	550
Glycerin, Distilled ,,	30	404	142	1,462
Red and Orange Lead ..... ,,	1,946	1,628	3,847	4,552
Nickel Oxide ..... ,,	2,607	3,047	13,397	16,678
Potassium Nitrate . ,,	5,335	14,659	6,349	16,555
Other Potassium Compounds .....cwt.	448,859	257,566	75,760	61,342
Sodium Nitrate ... ,,	131,699	123,666	82,862	74,428
Other Sodium Compounds ..... ,,	18,043	18,656	14,064	16,577
Tartar, Cream of .. ,,	4,083	4,407	15,843	16,201
Zinc Oxide.....tons	611	966	20,756	33,300
All other Sorts....value	—	—	206,607	222,192
DYES AND DYESTUFFS—				
Intermediate Coal Tar Products.....cwt.	5	77	55	784
Alizarine ..... ,,	2,982	233	13,658	5,583
Indigo, Natural.... ,,	87	—	2,135	—
Indigo, Synthetic .. ,,	—	—	—	—
Other Dyestuffs .. ,,	5,565	2,035	139,891	38,912
Cutch ..... ,,	8,243	6,153	10,922	10,552
Other Dyeing Extracts ..... ,,	6,659	2,210	24,720	8,904
Extracts for Tanning ,,	95,007	54,807	89,743	51,552
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground...cwt.	56,992	73,994	14,755	17,692
White Lead (dry) .. ,,	8,495	13,750	17,531	29,281
All other Sorts .... ,,	56,835	72,719	88,265	118,194
Mercury.....lb.	—	39,054	—	6,209
Total of Chemicals, Drugs, Dyes and Colours ...value	—	—	1,340,961	1,167,332

Exports

	Quantities. Month ending October 31.		Value. Month ending October 31.	
	1924.	1925.	1924. £	1925. £
CHEMICAL MANUFACTURES AND PRODUCTS—				
Ammonium Sulphate—				
To France .....tons	5,149	990	62,507	11,534
Spain and Canaries .... ,,	6,589	10,214	85,949	121,491
Italy ..... ,,	120	1,395	1,573	16,485
Dutch East Indies ..... ,,	6,163	200	83,267	2,460
Japan ..... ,,	4,713	8,292	61,255	99,458
British West India Islands ....tons	827	573	10,704	7,488
Other Countries ,,	2,389	4,718	31,395	55,830
TOTAL.. ,,	25,950	26,382	336,650	314,746
Acid Sulphuric ....cwt.	2,252	1,836	2,963	2,408
Acid Tartaric ..... ,,	1,278	1,734	7,564	9,726
Ammonium Chloride (Muriate) .....tons	246	276	8,031	9,180
BLEACHING POWDER cwt.	34,953	36,461	18,762	16,877
COAL TAR PRODUCTS—				
Anthracene .....cwt.	—	—	—	—
Benzol and Toluol galls.	1,680	3,923	218	401
Carbolic Acid .....cwt.	5,429	14,281	11,005	22,306
Naphtha .....galls.	4,274	8,681	329	875
Naphthalene .....cwt.	763	405	710	387
Tar Oil, Creosote Oil, etc.....galls.	4,259,049	3,769,639	148,780	114,799
Other Sorts .....cwt.	33,087	41,854	17,844	27,834
Total.....value	—	—	178,886	166,602
COPPER, Sulphate of..tons	71	488	1,817	11,748
DISINFECTANTS, INSECTICIDES, ETC. .....cwt.	33,350	40,687	87,405	107,765
GLYCERIN, Crude ...cwt.	17,457	15,885	47,259	44,500
,, Distilled.. ,,	9,532	12,543	36,032	48,309
Total..... ,,	26,989	28,428	83,291	92,809
POTASSIUM CHROMATE AND BICHROMATE cwt.	2,180	1,595	4,999	3,017
POTASSIUM NITRATE ,,	1,284	1,433	2,679	2,941
Other Potassium Compounds ..... ,,	3,002	1,063	16,466	13,956
Total..... ,,	6,466	4,091	24,144	19,914
SODIUM Carbonate ...cwt.	466,687	335,777	124,766	99,024
Sodium Caustic..... ,,	131,934	143,807	111,929	115,244
Sodium Chromate and Bichromate.... ..cwt.	4,229	3,662	7,937	5,785
Sodium Sulphate .... ,,	173,519	212,731	26,705	26,721
Other Sodium Compounds ..... ,,	42,094	45,613	59,230	60,610
Total..... ,,	818,463	741,590	330,567	307,384
ZINC OXIDE ..:.....tons	165	126	6,700	5,095
Chemical Manufactures, etc., all other Sorts value	—	—	349,722	315,871
Total of Chemical Manufactures and Products (other than Drugs and Dyestuffs).....value	—	—	1,436,502	1,380,125
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	10,553	11,615	122,347	74,200
Other Sorts ..... ,,	4,955	5,484	6,116	6,344
Total..... ,,	15,508	17,099	128,463	80,544
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground...cwt.	843	6,816	458	2,735
White Lead (dry) .. ,,	16,387	6,753	39,359	15,771
Paints and Colours, ground in Oil or Water ..... ,,	28,433	43,099	68,434	103,247
Paints and Enamels, Prepared ..... ,,	30,641	32,219	95,975	104,792
All other Sorts .... ,,	50,327	55,408	94,702	101,367
Total..... ,,	126,631	144,295	298,928	327,912
Total of Chemicals, Drugs, Dyes and Colours .....value	—	—	2,162,962	2,088,745

British Sulphate of Ammonia Report for 1924-25

A Serious Technical Problem: Downward Trend of Prices

We give below extracts from the fifth annual report of the British Sulphate of Ammonia Federation, in which conditions during the year 1924-25 are reviewed. Two important features are the continued downward trend of prices and the heavy loss in Japanese business attributed to the caking of sulphate in the powdery neutral form.

THE year under review has been remarkable for a substantial increase in the consumption of all forms of nitrogen. While there seems to be general agreement as to the percentage increase in consumption, namely 11 per cent., estimates of the production of the various forms differ somewhat. The following figures are probably not very wide of the mark :—

WORLD PRODUCTION OF NITROGEN IN TONS OF 2,240 LB. OF PURE NITROGEN, FOR THE YEAR ENDING MAY 31.

	1923-24.	1924-25.
By-product sulphate of ammonia	275,000	290,300
Synthetic sulphate of ammonia	231,000	254,800
	506,000	545,100
*Cyanamide	104,000	115,000
Nitrate of lime	18,000	25,000
Other forms of synthetic nitrogen	52,000	60,000
Total production	680,000	745,100
Deliveries of Chilean nitrate of soda in consuming markets	340,000	363,000
	1,020,000	1,108,100
Estimated total for agricultural consumption	900,000	983,100

* Cyanamide made in Japan is mostly converted into sulphate of ammonia and is included under synthetic sulphate of ammonia.

When it is remembered that the total consumption of nitrogen for agricultural purposes in 1913 was only about 595,000 tons, of which about 290,000 tons was supplied by Chile nitrate, it will be seen that in the last twelve years, the agricultural demand has increased by 64 per cent., while the production of forms of nitrogen other than Chile nitrate has risen by no less than 142 per cent.

Declining Prices

In view of the conservative mentality of farmers and the widespread popularity of Chile nitrate, achieved by efficient propaganda work before other forms of inorganic nitrogen were plentiful, it is not surprising that great sacrifices in price have had to be made by makers of sulphate of ammonia and other forms of nitrogen, in order to get their increasing production consumed. But the desire to expand the use of sulphate of ammonia might have been satisfied at a lesser cost to makers but for the special conditions obtaining in Germany.

While Chilean producers' prices ranged from £9 15s. 7d. in June, 1924, to £10 10s. 10d. per ton in May, 1925, export tax paid, f.o.b. Chile, yielding an average of £10 3s. 3d., the average price paid to our members for neutral sulphate of ammonia, 21·1 per cent. nitrogen, was £12 5s. 6d., a reduction of nearly 8 per cent. on the previous season. The parity of £10 3s. 3d. for nitrate, with 15·5 per cent. nitrogen, is £13 16s. 8d. for sulphate, with 21·1 per cent. The increase in consumption of sulphate of ammonia, amounting to about 10 per cent., has therefore been purchased at a sacrifice of just over 11 per cent. in the parity value.

It is unfortunate that British distillers of coal and shale should have had to accept so sensible a reduction in revenue from one of their chief by-products, at a time of acute industrial depression. And it is also regrettable that they have received no alleviation of their burden in the shape of a reduction in the price of sulphuric acid. Acid prices have ranged from about 42s. 6d. to 65s. per ton, and have thus remained at 50 to 100 per cent. over pre-war level.

These unfavourable conditions are directly traceable to the great disaster of the world war, and as the British output of nitrogen only amounts to 83,000 out of a total of 745,100 tons of pure nitrogen (excluding Chile nitrate) it is obvious that the Federation can only have a small voice in fixing selling prices.

The present low level of sulphate of ammonia prices is undoubtedly due mainly to the great economic pressure which is being exercised on Germany. Plentiful supplies of cheap nitrogen are a necessity for Germany if she is to honour her obligations; and her ability to pay reparations will vary in direct proportion to the measure in which she succeeds in reducing her imports of food. It is estimated that Germany consumed 335,000 tons of pure nitrogen, almost entirely for agricultural purposes, during the year under review, and it is obvious that the price at which this enormous quantity was sold must have a decisive influence on the price of all similar forms of nitrogen in other countries.

This appears to be a concrete illustration of the economist's paradox that it is impossible to obtain reparations, however justly demanded and imperiously needed, without ultimately compelling the recipients to accept the lower standard of price and living which the payer has to adopt.

The hope was expressed in our last report that it might be possible in the future to raise sulphate of ammonia prices to a level more nearly approaching the parity of Chile nitrate. The position in Germany, the increase in production of synthetic nitrogen during the year under review, and the further large increase which is taking place at the time of writing, preclude the possibility of this hope being realised for the present. There is every indication that the average price for sulphate for 1925-26 will be substantially lower than for the year under review.

On the other hand, the present low price for sulphate of ammonia is stimulating the demand to an extent which would have been considered fantastic ten years ago, and if no hope can be held out of any increase in price, the expectation may reasonably be indulged that the expansion in demand now being fostered may prove sufficient to absorb the output of the new synthetic plants which may be expected to be in operation shortly in Italy, France, and Belgium, and of the extensions of existing plant in Germany and Great Britain.

World Production and Distribution

The figures given in the table below showing the world's production and consumption of sulphate of ammonia are necessarily to some extent estimates, but they probably convey a reasonably accurate picture of the general position for the fertiliser years ended May 31, 1924 and 1925. (Ton= 2,240 lb.)

	Production.		Consumption.	
	1924. tons.	1925. tons.	1924. tons.	1925. tons.
Group 1.—Germany, United Kingdom, France, Belgium, Holland, Scandinavia, North Russia, Poland, Czecho-Slovakia, and Switzerland	1,877,000	2,034,500	1,556,700	1,627,470
Group 2.—Countries bordering the Mediterranean other than those in Group 1	35,000	43,000	139,350	213,440
Group 3.—Indian Empire, Philippines, Straits, Dutch East Indies, Siam, Japan, and China	127,000	161,900	442,700	435,701
Group 4.—Africa and neighbouring islands (excluding Egypt)	1,000	1,000	7,250	7,330
Group 5.—United States, Canada, Central and South America, West Indian Islands, Cuba, and Hawaii	417,500	468,000	306,730	429,520
Group 6.—Australia and New Zealand	15,100	17,000	10,300	12,010
	2,472,600	2,725,400	2,463,030	2,725,471

British and American exports of sulphate of ammonia for the last five calendar years were :—

	United Kingdom. tons.	United States. tons.	Total. tons.
1920	110,016	89,566	199,582
1921	128,433	102,614	231,047
1922	145,255	147,331	292,586
1923	247,536	150,595	398,131
1924	263,012	115,047	378,059

Home Production and Distribution

We give our usual table showing production and distribution; the figures for total production are taken from the Alkali Inspector's report, and relate to the calendar year, while the remaining figures relate to the "Fertiliser" year commencing June 1 in each year; hence the quantity stated below as exported for "1923" was exported during the year June, 1923, to May, 1924.

	Total production of Ammonia as Sulphate of Ammonia. (Based on Alkali Report).	Production of Sulphate-Ammonia as such.	Exported. (Customs Returns, excluding Channel Islands.)	Used for Home Agricultural Consumption.	Nitrate of Soda used for Home Agrl. use.
1913	432,600	*372,000	323,440	*40,000	*80,000
1914	426,400	*363,000	305,560	*50,000	*80,000
1915	426,300	*350,000	264,610	*64,000	*40,000
1916	433,700	315,500	188,270	144,600	*5,000
1917	458,600	283,500	31,740	234,000	*5,000
1918	432,600	331,500	37,630	269,000	*10,000
1919	397,500	361,360	116,130	233,500	*40,000
1920	**409,875	315,630	134,380	166,920	*40,000
1921	**260,850	229,390	116,380	136,000	*55,000
1922	**361,675	340,000	186,050	140,200	*57,000
1923	**441,632	401,400	258,280	142,400	*50,000
1924	**467,072	415,000	261,190	153,200	*40,000

* Estimated. The nitrate of soda figures are only rough estimates.
** Basis 25 per cent. ammonia.

Home Agricultural Consumption

The year under review was a better one for farmers than the previous year, and we are glad to be able to report a substantial increase of 10,800 tons or 7½ per cent. in the home demand for sulphate of ammonia. While the bulk of the demand was, as usual, concentrated on the months of March and April, many farmers placed their orders earlier, so that no delay took place in deliveries. The demand for May was disappointing, owing to weather conditions, and as a result we carried forward a larger surplus than usual, which was exported in June. The detailed figures for sulphate of ammonia are as follows :—

Home Consumption.	Scotland.	Ireland.	England, Wales & Channel Islands.	Total.
1919-20 ..	71,900	42,000	119,600	233,500
1920-21 ..	50,900	26,000	90,020	166,920
1921-22 ..	33,600	19,400	83,000	136,000
1922-23 ..	42,100	20,000	78,100	140,200
1923-24 ..	41,000	21,800	79,600	142,400
1924-25 ..	42,800	22,600	87,800	153,200

Exports: A Serious Technical Problem

There was a small increase of about 3,000 tons in the exports of sulphate of ammonia from the United Kingdom during the year. A falling-off of nearly 10,000 tons for Belgium and Holland was more than made up by increases of 8,000 tons for France and 3,000 tons for Italy. Egypt and the Canary Islands took 5,000 tons more between them, while the exports to our sugar-growing Colonies declined slightly. India and Ceylon show a gain of 950 tons.

But the two main features are a gain of 49,000 tons in Spain and a loss of nearly the same quantity in Japan. The Spanish figure is a most encouraging one, and represents an increase in consumption of about 46 per cent. during the year, the total consumption for 1924-25 in that country being 140,000 tons against 96,000 tons for 1923-24.

The loss of orders for 49,000 tons in Japan is a serious one. We deal with the cause in the next paragraph. There was a slight decrease in the total consumption in Japan from 307,000 tons in 1923-24 to about 287,000 tons for 1924-25. A good deal of speculative buying took place in the earlier year and the market took some time to absorb the heavy stocks purchased. The same reason must be assigned for the falling-off of 3,300 tons in the exports to China. Something like half the quantity imported by China in 1923-24 found its way to Japan.

While the year has seen a further increase in the output of neutral quality which now forms about 95 per cent. of the output in the United Kingdom, we regret to have to record that very considerable trouble has been experienced, both at home and abroad, owing to the tendency of powdery neutral sulphate to cake.

This vexatious difficulty has cost us the loss of 57 per cent. of our Japanese trade, and it is therefore impossible to overstate its importance. A technical Committee has been set up, which has diagnosed the causes of caking, and it is to be earnestly hoped that makers will put into practice the Committee's recommendations.

General Average Prices

The following are the average prices per ton for all deliveries, home and export, free on rails at makers' works in single bags free :—

	For 24¾ per cent. Ammonia. £ s. d.	For 25½ per cent. Ammonia, Neutral. £ s. d.
1917-18	16 7 3	—
1918-19	18 6 9	19 6 6
1919-20	22 13 3	23 15 3
1920-21	21 8 8	23 0 2
1921-22	12 13 3	13 19 3
1922-23	14 0 0	15 6 0
1923-24	11 19 11	13 5 11
	For 20·4 per cent. Nitrogen.	For 21·1 per cent. Nitrogen.
1924-25	10 18 0	12 5 6

Propaganda Work

The increase of 7½ per cent. in the home consumption is largely due to the good work done by our agricultural advisers. Testimony from many sides is constantly reaching us that our propaganda staff has obtained the confidence of farmers. The work has continued on the well-tried lines which experience has shown to be most successful in dealing with British farmers, and the list of those who have been induced to use sulphate of ammonia is constantly increasing. Each member of our staff is doing his best to get to know and to keep in touch with as many farmers as possible; and apart from personal visits and the arrangement of ocular demonstrations, both the principal and a number of the smaller agricultural shows throughout the country have been attended. The sales to gardeners and allotment holders by gas undertakings and others have shown an increase, and an increasing number of members have arranged window displays to draw attention to sulphate of ammonia.

While we have continued to support the work at Rothamsted as in previous years, a study of the experiments made in other countries has also been undertaken. For this purpose Mr. Carroll has visited Italy, France and Germany, and as a result of the information obtained by him, we have decided to try a series of experiments at Reading Agricultural College on the fertilising of pasture land with sulphate of ammonia. This practice has been attended with great success both in Northern Italy and in Germany, and has revolutionised accepted theories as to the treatment of grassland and the comparative feeding value of clovers and grasses. If what is known as the Hohenheim system can be adopted to suit English conditions, a very large new opening should be secured for nitrogen.

The use of sulphate of ammonia for destroying cornfield weeds is providing a permanent outlet for this fertiliser. A prospect for the use of increasing quantities of sulphate is also being opened up by the extension of the sugar-beet industry, and our advisory staff are in close touch with growers of sugar-beet in all parts of the country. Recent experience shows that an application of sulphate of ammonia at the time of sowing followed by a top-dressing of a nitrate is usually the best treatment for this crop. As a result of our advisers' activities several thousand tons of lime have been bought by farmers for use in conjunction with sulphate of ammonia.

The main feature in the overseas countries in which we are interested has been a notable success in India. In the short space of one year, sales have reached about 2,000 tons in the Bombay Deccan, in many districts of which sulphate of ammonia was practically unknown before. This quantity has been sold in little lots to the small village cultivators, and therefore represents a particularly valuable achievement from a propaganda point of view. This success has been due very largely to the efforts of Mr. A. B. Modak, whose untimely death this summer, we record with profound regret. We have every hope that his brother and his enthusiastic band of fellow students and workers will be able to carry on the good work. Shaw Wallace and Co. have been able to effect a large increase in the use of sulphate of ammonia in other parts of India and Ceylon. The total consumption in these countries during the year was about 12,500 tons, equal to 90 per cent. of the Indian output, which only a few years ago was nearly all exported to Java. This increase shows that the arrangement by which Indian makers have joined the Federation has proved of great benefit to India, to them and to us.

The large increase in the Spanish consumption of sulphate of ammonia is a tribute to the efforts of our propaganda agents in that country. The chairman and general manager visited Spain in May in order to make arrangements which it is hoped will add still further to the effectiveness of the propaganda work. As regards other countries, there has been a very large increase in the use of sulphate of ammonia in Italy, to which our office has materially contributed.

Our propaganda agents for Portugal and Canary Island have decided to cease business in those countries and we are therefore making the necessary new arrangements. Up to the outbreak of the recent political troubles in China, excellent progress had been made by Brunner Mond and Co. (China), Ltd., in introducing sulphate into new districts. It is impossible to say at present what effect the disturbances will have on our trade. New arrangements for propaganda work and field experiments are in course of preparation in Java, Sumatra, Malay Peninsula, the Sudan, Kenya Colony, Uganda, Sierra Leone, Trinidad and Canada, while it is proposed to continue our present activities in Spain, Italy, Egypt, Palestine, China, Jap an, and India.

Membership

The Federation numbered on June 1, 1925, 428 members, an increase of 7 over 1923-24, whose annual production represents about 90 per cent. of the total annual output in Great Britain and Ireland on the basis of the production for the calendar year 1924. The Federation also now represents a very large proportion of the output in Canada, India, and South Africa. We have received notice from ten members of the Federation, representing a total combined annual output of 760 tons, that they propose to terminate their membership on May 31, 1926. Two other members, representing a combined production of 3,000 tons, have also given us notice, but have intimated that the notice will probably be withdrawn. The insignificance of these withdrawals is a testimony to the loyalty of the overwhelming majority of our members. The tonnage of the new members who have joined during the year will make good the loss resulting from the withdrawals.

British Industries Fair, 1926

Notes on New Features

In view of the representations made by the exhibitors and buyers at previous British Industries Fairs the Government has decided to organise next year the London Section of the British Industries Fair, which was not held in 1925 owing to the continuance of the British Empire Exhibition. The British Industries Fair will, therefore, be held in London and at Birmingham from February 15 to 26, 1926, the London Section being organised by the Department of Overseas Trade and the Birmingham Section by the Birmingham Chamber of Commerce.

The Fair will, however, take place under particularly favourable auspices, for not only has the Government decided to organise the London Section, but in view of the urgent need for taking all possible steps to stimulate the sale of British goods both abroad and at home, it has also taken special measure to ensure the success of both sections of the Fair.

£25,000 Publicity Scheme

These measures include the expenditure of approximately £25,000 on a scheme of world-wide publicity on behalf of the Fair.

In addition to advertising the Fair in the newspapers and trade journals of practically every country in the world, personal invitations to attend are being sent to a list of over 50,000 overseas buyers and to some 100,000 buyers in this country. A general invitation to attend the Fair has also been addressed to the world's buyers through the medium of the Press. Instructions have already been sent to the overseas officers of the Department of Overseas Trade, who are stationed in every country of the world, to co-operate by every possible means.

In this way the number of overseas buyers, who have attended previous fairs in increasingly large numbers, and home buyers will be considerably augmented. No effort is being neglected to make the visit of the buyers both interesting and enjoyable, for a buyers' club has been provided and arrangements made for accommodation and entertainment, and the services of interpreters where necessary. Further, specially-qualified officers of the Department of Overseas Trade, each an expert in a different branch of British industry, will be on the spot to tender any help required.

All goods of the same class will be displayed at the Fair, side by side, and the buyer can therefore see the articles in which he is interested at a minimum of trouble and time. With the object of making participation as cheap as possible to exhibitors, the charge for space has been reduced this year at both London and Birmingham, the charge in London being as low as 2s. 6d. per square foot.

The Fair is essentially a trade fair, and, as on previous occasions, will be confined to actual British manufacturers, and during business hours only buyers will be admitted. At the request of the great majority of the exhibitors a novel feature is to be introduced next year. After 5 p.m. each day and from 1 to 8 p.m. on Saturday, February 20, the public is to be admitted.

Date of Fair Changed

The date of next year's Fair has been fixed at the request of the great majority of exhibitors, but the change of the date from that of 1924 need not cause the manufacturer or buyer the slightest agitation, for a large number of advertisements regarding the Fair have already appeared in sufficient time for overseas buyers to make arrangements to visit the Fair. This earlier date gives buyers the opportunity of seeing what British manufacturers can produce just prior to visiting Continental fairs, and during February it is usual for a large number of buyers from all parts of the world to be in Europe.

Another asset of the Fair to the exhibitor and buyer which is being more and more appreciated is the fact that every exhibitor at the Fair is the actual manufacturer of the goods displayed; thus the buyer realised that he is getting the articles at the first source of supply.

The Fair Catalogue

The catalogue of the Fair, printed in nine different languages and containing the names and addresses of all the exhibitors, together with a note of their productions, will be distributed to all buyers who attend the Fair, and will also be circulated to all the important buyers throughout the world. This catalogue constitutes a very valuable advertisement for exhibitors, and long after the close of the Fair many firms have stated that they have been able to trace large orders in the past through this medium.

For the 1926 British Industries Fair a record in the number of applications for space in the London Section has already been made. Many firms who have already exhibited at all the previous fairs have again applied for space, while the number of applications from entirely new firms is steadily increasing.

There is no foundation for the statement that the Fair is to be held in the grounds of the British Empire Exhibition.

By arrangement with the railways, holders of the official invitation card to the Fair will be entitled to their return fare from any part of the United Kingdom at the cost of a single fare and one-third. The concession is the more valuable in that there is none of the usual limitations as to trains or times.

Canada and the East African Colonies have now decided to take part in the Fair.

Continuous Foam for Fire Fighting

Undoubtedly one of the greatest drawbacks in the adoption of fire extinguishers is that they are strictly limited in action because the cylinders cannot be recharged while the apparatus is in use. Consequently, the fire fighting properties at any one time are limited strictly to the number of full extinguishers available.

This defect has been overcome by S. Dixon and Son, Ltd., of Swinegate, Leeds, by the production of their "Safoam—the continuous foam stream system," by which a continuous stream of fire extinguishing foam can be produced for any length of time off any existing pressure water supply. There is a series of mixing chambers which are connected to the water pressure by ordinary fire hose, and are discharged in series. This allows empty chambers to be recharged while others are operating and the flow of foam is unchecked. The chemicals are stored in dry form and are thus less likely to deteriorate and they have no injurious effects upon the appliances as is the case with some makes. No special knowledge is necessary for the loading or operation of the extinguishers. They are made in all sizes and the makers will send an illustrated booklet to readers mentioning The Chemical Age.

A British Chemistry Dinner

Unity under a "Chemical Emperor"

WHAT was described as a "British Chemistry Dinner" was held at the Connaught Rooms, London, on Friday, November 13, under the auspices of the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry, the Association of British Chemical Manufacturers, the Institution of Petroleum Technologists, the Society of Public Analysts, the Bio-Chemical Society, the Oil and Colour Chemists Association, and the Chemical Industry Club. Dr. W. R. Ormandy, chairman of the Chemical Industry Club, presided over a gathering of over 300.

The CHAIRMAN proposed "The Profession and Industry of British Chemistry" in a humorous speech.

Co-operation but not Amalgamation

Professor F. J. THORPE, who replied, said this was the first time there had been such a gathering of British chemists and British chemical industry, and he regarded it as one of the first fruits of the endeavours to bring about greater co-operation. There was but one chemistry and there should be one chemical front. He would always do all in his power to further that aim. But he hardly agreed with the view that they should go farther than co-operation and proceed to amalgamation. He was not yet prepared to accept that solution, because all the societies represented that evening were doing their work in the best possible way.

There was an example of amalgamation in the United States. The membership of the American Chemical Society was 16,000, distributed among 69 sections in 39 States. That reminded him of a dog with 69 tails, any one of which might, as occasion demanded, wag the dog, and that was a process which no self-respecting dog really liked. He did not believe that anything was to be gained by the election of a chemical emperor, because the president of such an amalgamated society would be a chemical emperor, if it were not the secretary, which in most cases it was. (Laughter.) Just 50 years ago, the Government, in what was perhaps a spirit of altruism, or because they had premises they did not want, decided to house the existing scientific societies in Burlington House, and the Chemical Society was assigned the smallest apartments of the lot because in those days it was the smallest society. It had only 700 members and it had an income of about £2,000 per annum. Then, as now, its expenditure exceeded its income. It had now 4,000 members, and since that time those mushroom growths, the Society of Chemical Industry and the Institute of Chemistry, had sprung up. These were now sturdy oaks, although still, compared with the ancient lineage of the Chemical Society, they were mushroom growths still. The point, however, was that the Chemical Society's members had to crowd themselves into apartments originally designed to hold 700 people, and anyone who had sat in the meeting hall for any lengthy period when it was filled with members could realise what an atmosphere without oxygen really was. The accommodation was such that it would be necessary to remove the portraits of past presidents—unequalled examples of Victorian portraiture—to utilise the walls for the purpose of bookcases. Why should not the Government again be afflicted with an altruistic mood and provide a Chemistry House suitable for the accommodation of all the chemical societies? Why not utilise the Museum of Practical Geology in Piccadilly, which had a frontage in Jermyn Street also? That would make an admirable Chemistry House.

One Big Thing in Chemistry

Mr. W. J. U. WOOLCOCK (President of the Society of Chemical Industry), who also replied, asked whether there was not one big thing in chemistry to-day that was greater than anything else. For 50 years, chemistry had been a superior kind of cooking and chemists had been engaged in a species of cooking. The position to-day, however, was that the nation which first realised that this cooking industry had gone and that we were entering on a new era of chemistry which did not depend so much upon the chemistry of this, that, or the other thing, but upon scientific theories, very often physical in character, was the nation which would make the greatest headway. The nation that could do that first would win in the long run. Anyone who wandered from north to south of the Rhine would realise that the German nation there was growing more and more food by the aid of fertilisers. That would be one of the biggest factors in the international position, and it was for chemists to see what, out of this poor old torn world, could be built up. He felt confident from such a gathering as the present one, at which every chemical society in England was represented, that our prospects in chemical industry in this country were second to none in any part of the world.

The only other toast was that of "The Guests," proposed by Mr. W. H. Edwin Coley (vice-chairman of the Executive Committee of the Chemical Industry Club), and responded to by Mr. C. A. Hill, Treasurer of the Association of British Chemical Manufacturers.

The dinner was followed by a musical programme, arranged by Mr. T. Miller-Jones, and dancing.

British Association of Chemists

The Profession and Public Life

MR. C. S. GARLAND, the newly-elected president of the British Association of Chemists, in his speech at the dinner held in Manchester, referred to the position of chemists in public life. He regretted that chemists appeared to take so little interest in public affairs, and whereas members of almost all other professions were well represented at least upon local governing bodies, chemists very rarely held such offices, nor were they apparently greatly interested in major or minor aspects of government. This, Mr. Garland greatly regretted, since he held that so important a profession ought to attain the place in the social order due to it.

Only those who know the profession of chemistry from within realise the self-sacrificing devotion which animates the chemical research worker, and those only understand the enormous benefit to the community which accrues from what might appear to the lay mind as nothing more than a piece of scientific elaboration. While chemistry was in its infancy—and that was not very long ago—this was of necessity the attitude of all members of the profession. They had to justify for themselves the value of the science they professed, and that left very little time for interest in oneself or one's neighbour. It is evident, therefore, that this apparent apathy of the chemist is real. He is not too lazy to interest himself in public affairs, he is too busy.

There is, however, always a danger that a habit of mind, having outgrown its usefulness, will retain too much sanction as a tradition, and it is true, as Mr. Garland has stated, that the chemist, not now in the position that he was twenty years ago, has not yet fully realised his new and increasing responsibilities. He has not realised them fully, but the formation of the British Association of Chemists has proved that the collective consciousness of chemistry as a profession, is beginning to realise itself. The Association has frequently asserted that, from a political point of view, it remains unbiassed, but this is not to say that it takes in politics no interest at all. Whether his position is recognised or no, the chemist is vital to the well-being of any civilised community. It is fashionable to suppose that might, as represented by numbers, must necessarily be right, but this fallacy, most recent and most dangerous, will die. But it is, nevertheless, true that this fundamental error has greatly retarded the social development of the professions which are numerically in the minority; but this state of things will not continue so soon as the chemist, using the Association as his mouthpiece, educates the public to show all that chemical science has done for its advancement and welfare.

It is in this wider aspect of politics that the Association is so keenly interested. It is often said that we shall have to look in the future to a combination of the best elements in science, commerce, and general administration if our civilisation is safely to be steered through the troubled waters of this, its most critical period. The chemist as an individual, can do much, but he can do infinitely more as a member of an organised society. The real birth of the medical profession began with the formation of the British Medical Association. The chemist, though in a different sphere, is no less valuable to civilisation than the physician. The awakening of his profession has begun with the British Association of Chemists.

H.T.F.R.

Indian Chemical Notes

(From Our Indian Correspondent.)

The Tata Iron and Steel Co., as well as the Indian Galvanising Co., have in their representations to the Tariff Board asked for the removal of the import duty of 15 per cent. on spelter, which is required by the companies in the galvanising process. There is no prospect of spelter being produced in India, and if the duty is removed it may give a great impetus to the galvanising industry and thereby to the steel production, a considerable amount of which the galvanising industry will consume.

Progress of Mineral Industries

The remarkable advance made by the mineral industries in India during recent years is evidenced by the recently published quinquennial review of mineral production for the period 1919–23. The average annual value of the output of minerals for which reliable statistics are available during the period was £24,500,000, as against £11,750,000 in the previous quinquennium. The coal industry showed fluctuations in production. One of the outstanding improvements adopted in the industry during the period is the extended use of electricity for all purposes. The employment of by-product ovens in coke-making has extended considerably, and there are now batteries installed at Giridih field, Jamshedpur, Kulti, and Jharia field. The by-products recovered are tar and ammonia, sulphate of alkali being manufactured with acid made locally from imported sulphur.

The iron and steel industry also made considerable strides during the period, and the production of Tata's more than doubled. There was also an increase in the output of manganese, the average annual production being 624,000 tons, as against 577,000 tons in the preceding quinquennium.

In mica, India easily leads the world. The production of fine splittings by hand is an art which is performed to perfection in India, and owing to the brisk demands for mica splittings a certain amount of mica was imported into India from the United Kingdom, the United States, and Japan for conversion into fine splittings and subsequently exported. India also holds a monopoly in the production of shellac, and has it in her power to hold a predominant position in the manufacture of micanite, an artificial commodity made out of the smallest thinnest films of mica cemented together with shellac dissolved in spirit.

Lead and silver also showed large increases, but gold showed a steady decline. Owing to the high price of tin, tin mining progressed steadily during the period. Primitive native principles of work are being steadily replaced by improved methods, and dredging machinery is introduced.

Borings for Coal

The possibility of discovering coal deposits in the Bombay Presidency is under discussion. Borings, commenced in 1918 and carried to a depth of 1,200 ft., have not been successful. Bhusawal, Dhulia, and Kalyan are the three principal sites mentioned as suitable for boring where there is a possibility of striking coal. There is likelihood of further boring being undertaken. If the borings are successful and concealed coal fields are discovered, Bombay's difficulty about coal will have been removed.

A new company known as the Assam Match Co. has been started in Assam, with head office in Calcutta, and an authorised capital of Rs. 7 lakhs, for the purpose of erecting and working a match factory in Assam and dealing in its products. The company has been promoted by the Swedish Match Co., which has already erected factories in other parts of India. The total annual consumption of matches in India is estimated at 13 million gross of boxes, of which 7 million are the products of the Swedish Match Co. The consumption in Assam alone is 60,000 gross of boxes per month, and the new factory is equipped to manufacture 31,250 gross per month. The company has obtained concessions from the Government of Assam embracing a total area of 600 square miles of forest land, which will ensure an unlimited supply of timber of the required quality for match manufacture. The site of the factory is about a mile from the Dhubri railway station on the Assam Bengal Railway. The company estimates a return of 14 per cent. on its capital.

Water Hyacinth

Water hyacinth is a weed that has spread to such an extent in Bengal that it has grown to be a great menace to Bengal waterways. Efforts, therefore, are being made to eradicate this weed. The Institute of Plant Industry, Indore, has now found a new use for this weed as an important crop fertiliser for jute and rice crops. The Institute carried out a series of experiments whereby it has been conclusively proved that by means of the Chinese methods of composing crop residues the weed can be turned into a valuable manure.

S. G. W.

Pulp Binders for Briquetting

Process of Manufacture Described

A paper describing the possibilities of pulp binders in the manufacture of briquettes was presented by Mr. C. J. Goodwin and Dr. G. N. White at a meeting of the South Wales Institute of Engineers, held at Swansea on Thursday.

To prepare a pulp binder, it was pointed out, vegetation (which may consist of grass, straw, water reeds, cactus, prickly pear, bagasse, beet sugar residues, flax residues, soya bean waste, sisal hemp waste, banana leaves or other plant tissue) is stacked in a suitable manner and watered from time to time with a small quantity of a solution of substances requisite for the growth of the organisms. After a period which will vary between three weeks and three months, the vegetation has been reduced by fermentation to a pulpy mass consisting of a mixture of the binding substances (mucus and humus) and residual fibres. These fibres have an important action in giving toughness to the briquettes. The material in this state is then charged into an edge runner mill or other suitable device, and rendered alkaline by the addition of 2 per cent. of its dry weight of sodium carbonate. The material in this state is now ready for use, but is usually first mixed with an equal quantity of the fuel or other material to be briquetted, so as to give a product which is readily handled and measured for incorporation with the remainder of the fuel. The mixture is not sticky, and the agglomerating and hardening properties of pulp binders are only finally developed by heating to about 100° C. This can be accomplished by either (*a*) heating the binder and briquetting a cold mixture, with subsequent heating of finished briquettes; (*b*) heating the whole mixture in the pug mill and briquetting hot as in ordinary briquetting practice; or (*c*) mixing and briquetting cold, and heating the finished briquettes. The final heating operation is required to dry the briquettes, which usually leave the machine with between 10 and 15 per cent. moisture, and if extra resistance to the weather is necessary, the drying or "cooking" temperature is increased to about 200° C.

It will be seen that the process of manufacture calls for no skilled labour other than intelligent supervision, and that no specialised plant or extensive alterations to existing plant are required.

Cost of Manufacture

The costs of manufacture of pulp binders are closely related to questions of climate, transport, labour and locality. Taking a broad view and given sufficient raw material within reasonable haulage distance of the briquetting plant, it is estimated that the total cost at the factory of pulp binder ready for use to vary between 50s. and 100s. per ton, on a dry weight basis, and of this total 20s. represents the cost of fermentation and preparation. Under favourable circumstances and in tropical countries, the corresponding figures probably lie between 35s. and 60s. per ton. With anthracite, 4 per cent. of binder is ample, equivalent in England to, say, 3s. on the average for binder cost per ton of ovoids produced. The extra cost of drying and "cooking" may reasonably be taken at 9d., making a total cost of 3s. 9d. per ton, exclusive of briquetting costs. This compares with a normal usage of 8 to 10 per cent. of pitch, which at the present low cost of 40s. per ton, would represent, say, 4s. 6d. per ton for binder cost.

The actual cost of briquetting, overhead charges, etc., may be taken as the same in both cases, although when using pitch the cost of the superheated steam used in the pug mill is an appreciable item. As regards capital costs, the investment represented by the dryers and incorporating mills is off-set by the absence of pitch crackers, pug mills, and part or the whole of the boiler plant. Similarly, the cost of adapting plant involves little capital expenditure.

Properties of Water Line Paints

Oil and Colour Chemists' Meeting

THE monthly meeting of the Oil and Colour Chemists' Association was held in London on Thursday, November 12. Speaking on "Chevreul: the Chemist, the Philosopher, the Man," Dr. E. H. Tripp pointed out that, while Chevreul's main achievement was his discovery of the composition of the fats, the centenary of which was recently celebrated in Paris, he also devoted many years to the study of colour and might be regarded as the father of oil and colour chemistry. Michael Eugène Chevreul was born in 1786, and at seventeen years of age went to Paris to study chemistry under Vauquelin, whom he succeeded in 1810 as professor of chemistry at the Museum of Natural History. In 1824 Louis XVIII installed Chevreul as director of the dyeing department in the State tapestry works, and he was twice president of the Academy of Sciences.

In a paper entitled "Exposure Tests on Water Line Paints," Mr. E. F. Figg said that although in recent years records of extensive paint exposure tests had been published, notably by Friend and Gardner, none had dealt with the special case in which the paint has to withstand the alternate action of salt water and air, as in the protection of metal structures in tideways and of the waterline or "boot-top" of ships. It was decided, therefore, to carry out a test on a limited number of paints under these conditions, a few proprietary paints being included for comparison with those made up in the laboratory from ingredients which had been fully examined. A convenient site for the exposure was found on a pier at Woolwich, and the tests were made on steel plates, which were suspended by ropes in such a manner that at high tide they were submerged, and at low tide they were exposed to the atmospheric conditions. The salt concentration at Woolwich is normally less than 1 per cent., but it was not so considerable as to affect the result.

Results of Tests

The tests were stopped after fifty-eight weeks, and by this time even the best of the panels were beginning to show signs of incipient breakdown, while many were badly corroded. The results indicate that for the conditions given, the best protection is afforded to steel work by two coats of a special paint consisting of zinc oxide and zinc dust in raw linseed oil. A similar protection is afforded by one coat of red lead in raw linseed oil followed by one of white lead in the same vehicle, but the resulting surface was not so smooth at the end of the test. The inhibition of rusting anticipated from the use of basic lead chromate in raw linseed oil as a priming coat was not confirmed; indeed, better protection resulted from using red oxide of iron in raw oil as a first coat, while this in turn proved inferior for that purpose to red lead in raw oil. The use of varnishes for improving the resisting powers of the finishing coats was found to be detrimental rather than otherwise, while the one example of a bituminous mixture which was tried proved to be of less use than any other paint. It was surprising to find that of the six proprietary paints specially intended for waterline protection, only one gave satisfactory results, and this consisted of zinc oxide in a slightly thickened linseed oil. In general, it would seem that the most important characteristic to be sought in a waterline paint is that of permanent elasticity, and, if this is so, then a paint which satisfactorily withstands the action of the ordinary weathering agents over a period of years will prove satisfactory for waterline protection, but for a shorter period. This presupposes that at least twelve hours can be allowed for drying.

Rust-Resisting Steel

IN a paper read on Friday, November 13, before the Institution of Engineering Inspection, in London, Mr. W. H. Hatfield, principal of the Brown-Firth Research Laboratories, Sheffield, pointed out that the metallurgical developments of recent years had resulted in the successful production of steel, which could reasonably be claimed to be completely resistant to atmospheric influences, marine conditions, and a very extensive range of corroding media. The claims of the rust and corrosion resisting steels now available were firmly established by unquestionable experimental evidence. There was a great future in the industrial application of these steels.

A New Ammonia Synthesis Process

The Mont Cenis System

IN *Deutsche Bergwerks Zeitung* of October 27 some details are given of a new German process for ammonia synthesis which, however, fall short of a complete description. The process is owned by the Mont Cenis Gewerkschaft, which, in reply to numerous conflicting accounts of the process in the German Press, has issued the following announcement:—

"The so-called Mont Cenis process, as it has been more or less rightly named, consists of a combination of known processes with a hitherto unknown synthesis, which permits a better use of coke oven gas in that this acts directly or indirectly on nitrogen. The great advantages of this new process are the comparatively small cost of the necessary plant and the use of a completely new catalyst, the composition of which is a secret. With regard to this catalyst, it may be stated that while the Badische Anilin u. Sodafabrik works with a pressure of 200 to 300 atmospheres, and while by later processes the pressure tends to be always higher until in the Claude process it is about 1,000 atmospheres, the so-called Mont Cenis process works with a pressure of less than 100 atmospheres. Then, again, while other processes use temperatures which are quite high, tending to reverse the ammonia foundation, the Mont Cenis process uses a considerably lower temperature—about 400° Cel. Moreover, the output of ammonia is essentially higher than by any other known process.

The *Deutsche Bergwerks Zeitung* remarks that the striking feature of the process seems to be the discovery of a secret catalyst that favours the combination of hydrogen and nitrogen in such a way as to lead to great economy in energy expenditure. It supposes that the coke oven gas will have to be freed from carbon and sulphur compounds, both of which are catalyst poisons. In the Claude process, in which coke oven gas is also the source of the hydrogen required, the carbon and other compounds are removed from the hydrogen by the use of a low temperature said to be round minus 200° C., but the method used at Mont Cenis is not disclosed. Assuming the process to operate successfully and to be used on a commercial scale, the question arises as to how these more cheaply produced products may affect the market for nitrogen compounds. The actual cost of production is less important than the question as to whether sales are effected within or without the Nitrogen Syndicate. At present the Mont Cenis concern is a member of the syndicate, but there are several important producers who have not yet come into it.

The Secret of Colour in Dyes

AT the Franklin Institute, U.S.A., Professor Julius Stieglitz, of Chicago University, recently gave a scientific explanation as to the cause of colour in the composition of dyes, which he illustrated during his lecture with the following demonstration.

A white powder was dissolved in a glass, and by adding to the solution liquids which were equally colourless the contents of the glass changed successively to yellow, red, brown, and black, while the lantern projected on the screen the carbon chains and rings of the structural symbols of the dyes produced. What was happening, it appeared, was a loosening up of a pair of electrons belonging to one of the carbon atoms so that they could vibrate in tune with the light waves received by the substance. The waves at the violet end of the rainbow spectrum were easiest to absorb, and the light that was left to be perceived by the eye belonged to the red and yellow end of the spectrum. By giving the electrons a little greater freedom of movement they were able finally to respond to all the wave-lengths and so to absorb all the light, thus leaving the liquid black and opaque. This phenomenon occurs because the colour that one attributes to an object is not the colour that it catches out of the light and holds, but the colour that it rejects and returns to the eyes. According to the professor's theory, all dyes and pigments are so constructed as to have a positive atom which is short of electrons closely adjacent to a negative atom possessing a surplus of planetary electrons, and the pull of the positive atom on these electrons sufficiently detaches them from their allegiance to the negative atom to enable them to vibrate to the stimulus of the passing light waves, just as the strings of a piano echo the sound waves of the air.

Germany's Fertiliser Consumption

Developments in Nitrogen Fixation

ARTIFICIAL fertiliser consumption in Germany in the fertiliser year 1924-25 amounted to 340,000 tons fixed nitrogen, 370,000 tons phosphoric acid (P_2O_5), and 663,756 tons pure potash (K_2O). This constitutes a record consumption of artificial nitrogen fertiliser. Phosphoric acid consumption increased by more than 100 per cent., and potash consumption was almost a record, according to a recent U.S. official report, which also points out that the increase in consumption of artificial nitrogen emphasises the growing importance of the air-fixation industry in Germany. This industry, represented before the war by one Haber-Bosch plant at Oppau and two calcium cyanamide plants at Trostberg (Bavaria) and Knapsack, near Cologne, produced around 12,000 tons fixed nitrogen in 1913. During the war, stimulated by the need for nitrogen for the manufacture of explosives and fertilisers, the industry grew rapidly. The Leunawerke, the largest air-fixation plant in the world, was erected in 1917; it was built to a capacity of 200,000 tons fixed nitrogen, but the 1917-18 output of both the Oppau and the Leunawerke plants amounted to only 100,000 tons. Since the war, production has increased rapidly. While the calcium cyanamide output declined from a peak of 66,000 tons N in 1917-18 to around 50,000 tons in 1924-25, ammonium sulphate production at Oppau and at the Leunawerke rose to almost 300,000 tons in 1924-25. The joint operation of a Norwegian air-fixation plant on the Glommsfjord is now proposed.

Production of ammonium sulphate by-product of coke plants has declined from a pre-war level of around 110,000 tons to about 75,000 tons. This is explained by the decreased demand for coke from the German iron and steel industry. Germany has become a considerable exporter of ammonium sulphate and cyanamide, particularly in the last two years. Net exports of ammonium sulphate in 1924 amounted to almost 100,000 tons. Germany exported some 7,000 tons more cyanamide in 1924 than was imported.

Germany's important potash deposits place the country in a satisfactory position in relation to this fertiliser.

Smokeless Fuel

The "Pure Coal Briquette" Process

THE present crisis in the colliery industry has served to draw increasing attention to the whole question of the more scientific utilisation of raw coal, including both low and medium temperature carbonisation, as well as hydrogenation. Some rapid developments are now taking place in connection with one of the most interesting British processes, the "Pure Coal Briquette," and a large commercial plant with a first section of 100 tons throughput per 24 hours, comprising two retorts of 50 tons each, is at present being erected at Leigh (Lancashire) by Leigh Smokeless Fuel, Ltd. A number of prominent Lancashire colliery men are associated in the project, and the problems are stated to have been solved as a result of several years' experience with a 20-ton retort.

The "Pure Coal Briquette" process is already well known, being mainly the work of Mr. E. R. Sutcliffe, of Sutcliffe, Speakman and Co., Ltd., who is also a director of Leigh Smokeless Fuels, Ltd. Essentially the principle depends on the fact that a hard smokeless fuel for household, steam generation, and other purposes can be produced with a low volatile content (3-5 per cent.), which is absolutely free burning because of its structure, just as in the case of charcoal, which contains no volatile matter. The process consists in roughly pulverising the coal, mixing it with 10-15 per cent. coke breeze—or the breeze produced in the process—oxidised coal, or other product, to give a blend that does not expand on carbonisation, briquetting at the extremely high pressure of 6-10 tons per square inch in a new powerful briquette press without the use of pitch or other binder, and then carbonising the resulting "Pure Coal" briquettes.

The retort used is of the simple vertical cylindrical pattern, the fuel being admitted at the top and caused to travel down slowly by gravity on the usual lines, and being discharged continuously at the bottom in the form of intensely hard smokeless briquettes. Heating is on the efficient internal principle, using a stream of inert gas and steam, raised to the required temperature by passing through regenerators, travelling up through the descending charge. The temperature of carbonisation can be maintained at about 1,400°-1,600° F. without detriment to the free burning qualities of the fuel, and gives low temperature oils, with the advantage that nearly all the volatile matter of the raw coal is decomposed. The result is an extremely high yield of gas, averaging 11,000 cubic feet per ton at 500 B.Th.U. per cubic foot, whilst the ammonia, because of the steam used, is about 40 lb. standard sulphate and the oils 25 gallons, only about 3-5 per cent. volatile matter being in the residual fuel already indicated.

Additional claims are that the yield can be varied within wide limits by altering the speed of the travel and the quality of the inert gaseous medium, so that in an emergency, coke ovens could be used when the demand for metallurgical coke falls off; the same applies to gasworks retorts. Another advantage is that small coal can be used equally as well as the large slack and lumps.

Synthetic Ammonia Production in U.S.A.

The Problem of Cheap Hydrogen

AMERICA has been accused of slowness in the development of synthetic nitrates (*Industrial and Engineering Chemistry* states in a review of the nitrogen fixation industry), but a survey of the situation cannot fail to lead to the conclusion that, after all, America is pursuing a rational course and is particularly strong in the research and engineering involved in this new industry. The data which we present with respect to commercial production are based largely upon experience in the design, construction, and initial operation of a plant having a daily capacity of three tons of anhydrous ammonia. The first attempt to operate this unit proved unsuccessful, but within twenty-five days the difficulties, principally mechanical, were overcome. The plant has been in continuous operation since, save for four days when a shut-down was necessary to make changes in electrolytic cells. This record performance brings much credit to those connected with the enterprise.

A number of plants are either in operation or under construction at the present time. Those operating are the Atmospheric Nitrogen Corporation at Syracuse, daily capacity 30 tons, using the modified Haber or General Electric process; the Niagara Ammonia Co. at Niagara Falls, operating the Casale process, present capacity 13 tons, to be increased to 18 by the end of the year; the Mathieson Alkali Works at Niagara Falls, producing 3 tons daily with additional capacity of 10 tons in prospect, and using features of several processes; and the Pacific Nitrogen Corporation at Seattle, operating what has been called the American process, capacity 3 tons. Two plants are under construction: one, that of Lazote, Incorporated, 25 tons capacity, using the Claude process and being erected at Charleston, W.Va.; the other is the 3-ton unit of the Roessler and Hasslacher Chemical Co. at Niagara Falls, where the American process is to be installed. At least two other companies, the Grasselli and the Dow Chemical Co., are said to be interested and carefully looking into the question.

The chairman of the Anglo-Chilean Consolidated Nitrate Corporation of Great Britain has recently announced that his company is investing £1,000,000 in equipment for the Guggenheim process, with which 350,000 tons per annum of natural Chilean nitrate will be produced along such scientific lines that Chile expects to meet the problem of competition with synthetic ammonia.

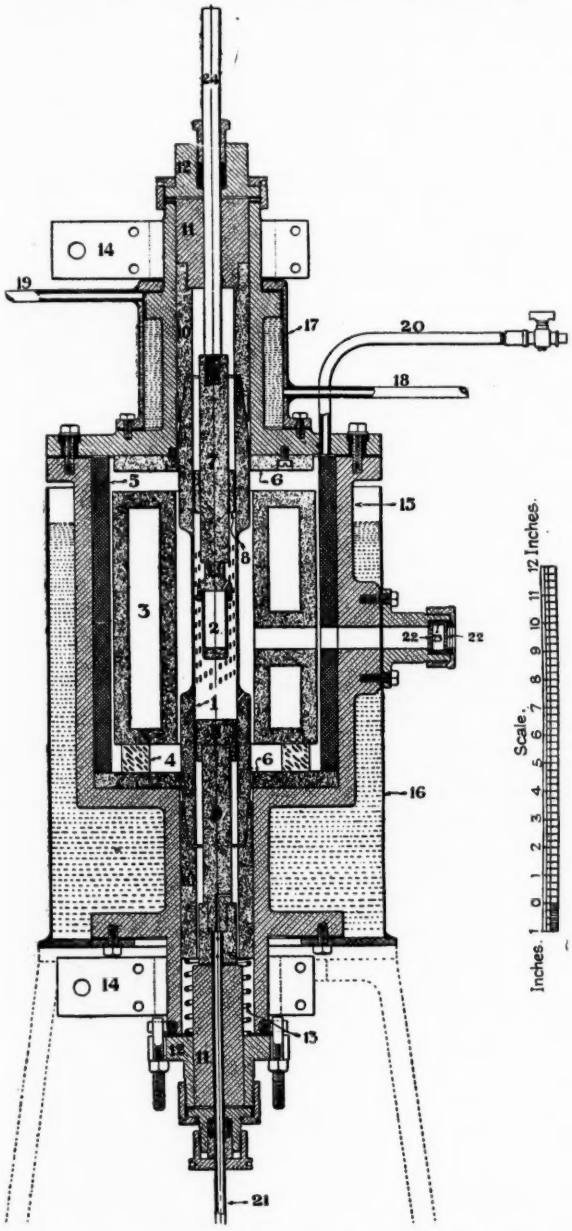
The development evidenced in America seems to us ample justification for the maintenance of the Fixed Nitrogen Research Laboratory, where research necessary to what has been accomplished has gone forward under government auspices with benefits to the people as a whole which could not be expected under any other plan. We have previously called attention to the utility of such a nucleus, not only in developing new catalysts and establishing new principles, but in training men who can render industry invaluable service.

It is noteworthy that development continues where conditions are favourable to market the finished product, anhydrous ammonia, or where hydrogen of proper purity can be made available at attractive figures. Some of the plants are to use waste hydrogen from other processes. This adds further proof that hydrogen has become the key to the situation and that power has fallen to second place.

An Improved Electric Vacuum Furnace

Construction Described to the Faraday Society

In a paper read before the Faraday Society, at a meeting held in London on Monday, Professor J. R. Partington and Mr. N. L. Anfilogoff, described an improved form of electric vacuum furnace, which they had designed on the basis of the Otto Ruff type. Full details of construction are given in



the accompanying diagram and key, the new furnace consisting essentially of a graphite tube, surrounded by a radiation case to prevent loss of heat and enclosed in an air-tight, water-cooled bronze casing. Having been able to work under vacuum at temperatures approaching that of the volatilisation of carbon, the authors believed that the furnace was the most satisfactory of its type as yet described.

The furnace is designed for studying reactions at high temperatures, the reacting substances, if solids, being contained in a graphite crucible turned from the same material as the hot tube and maintainable either in a high vacuum, or in an atmosphere of an inert or reacting gas. The issuing gas is capable of analysis if the vacuum lead from the furnace to the pump has a T-piece connecting to some sort of gas holder, a pipe from the latter being either connected straight to the pump, or, by means of another T-piece, to the original vacuum lead to the pump, but nearer the pump than the first T-piece, the intermediate piping containing a cock. Thus, having passed the gas to the pump for a time, to ensure uniformity, the issuing gas may then be diverted through the holder and a quantity collected. If necessary, the gas pressure in the holder may be brought to atmospheric pressure by allowing a gas unlikely to affect the results of the analysis to enter.

Details of Construction.

1. Hot tube ; graphite.
2. Crucible ; graphite.
3. Radiation case ; graphite.
4. Supports for radiation case ; magnesite.
5. Heat-resisting liner ; fireclay.
6. Heat-resisting discs ; graphite.
7. Crucible suspenders ; graphite.
8. Hot tube seals ; graphite.
9. Hot tube seal support ; graphite.
10. Hot tube adaptors ; graphite.
11. Furnace seals ; bronze.
12. Vacuum gland adaptors ; tinned bronze.
13. Hot tube supporting spring ; bronze.
14. Electric leads ; bronze.
15. Furnace casing ; tinned bronze.
16. Water jacket ; zinc.
17. Water jacket ; tinned bronze.
18. Water inlet ; copper pipe.
19. Water outlet ; copper pipe.
20. Gas inlet ; copper pipe.
21. Vacuum lead ; copper pipe.
22. Windows ; quartz.
23. Distance piece ; bronze.
24. Crucible suspender extension ; mild steel.

N.B.—All water and vacuum joints are of rubber insertion, all insulating joints and bushes of vulcanite, and all stuffing boxes packed with asbestos and tallow.

Chemical Matters in Parliament

Sugar Beet

Major Sir Harry Barnston (House of Commons, November 15), replying to Colonel Day on behalf of the Minister of Agriculture, said that on June 4 last 56,200 acres were returned as under sugar beet cultivation in Great Britain ; 10 factories were expected to manufacture sugar during the 1925-26 season ; and in that period the output of refined beet sugar was estimated to be 57,000 tons. He asked notice of Mr. Thurtle's question as to how many factories were owned by foreign capital.

Iron and Steel Industry Inquiry

The Prime Minister, in reply to Captain Benn, said that the Civil Research Committee had not completed its inquiry into the iron and steel industry and no Government action was therefore at present possible. He did not think that the decision would be long delayed.

Trade Facilities Act Guarantees

Mr. Churchill (House of Commons, November 16), in reply to Sir F. Wise, said that the total amount covered by the guarantees which the Treasury had expressed its willingness to give, stood on September 30, allowing for schemes withdrawn, at £58,827,241, and the loss at £13,803.

Safeguarding of Industries

Sir P. Cunliffe-Lister (House of Commons, November 17), replying to Mr. A. V. Alexander, said that the duties contemplated under the new safeguarding proposals of His Majesty's Government were applied equally to imports from all foreign countries, and were in strict conformity with the most-favoured-nation clause of the Anglo-German Commercial Treaty. The German Government had, however, raised the question of the bearing of the Protocol to that Treaty on duties of this character. In reply His Majesty's Government had called attention to the fact that the Protocol reserves to both parties the right to take appropriate measures to preserve their own industries.

From Week to Week

THE AMOUNT OF THE SUBSIDY paid to the coal industry under the Coal Mining Industry Subvention, 1925–26, in respect of the period to October 31, was £3,361,853.

THE NORMAN LOCKYER LECTURE was delivered in London on Monday by Sir Oliver Lodge on the subject of "The Link Between Matter and Matter," in which he stressed the importance of taking into account ether as a link.

MR. N. H. GRAESSER, managing director of the Graesser Monsanto Chemical Works, Ltd., of Ruabon, North Wales, has returned from a business trip to America, which included a visit to the Monsanto Chemical Works, St. Louis.

THE FEDERATION OF BRITISH INDUSTRIES is stated to be much encouraged by the removal of the embargo on foreign loans, a move for which they have frequently petitioned. This further return to normal conditions will, the Federation considers, greatly assist the export of British goods.

THE FIRST SHIPMENT OF AMMONIUM PERSULPHATE produced by the North American Chemical Co., Bay City, Mich., has just been delivered in New York. According to *Drug and Chemical Markets*, this is the first time that ammonium persulphate has been manufactured in the United States.

THE HUNDREDTH ANNUAL COURSE of Christmas Lectures for Juveniles at the Royal Institution will be delivered this year by Sir William Bragg on "Old Trades and New Knowledge." "The Trade of the Sailor" is the title of the first lecture on Tuesday, December 29, and the following five lectures will be on the trades of the smith, the weaver, the dyer, the porter, and the miner.

THE DANGEROUS NATURE OF BORAX is the subject of comment in the annual report of the Lancashire county analyst just issued. Two samples of carbonate of soda were found to contain an admixture of borax, and as borax is arsenical, might have had serious results. For medicinal use, borax is required to contain less than five parts of arsenic per million, and invariably the grocer's products are within that limit, but it would appear desirable to take legal proceedings to stop the sale of such highly arsenical borax as might reasonably be considered dangerous.

A DELEGATION FROM THE GERMAN GOVERNMENT was received recently at the Board of Trade for the discussion of questions as to the interpretation and effect of certain provisions of the Anglo-German Treaty of Commerce and Navigation. Although the Treaty was only ratified last September, the contention of the Germans is that since its signature the situation has been changed by the reimposition of the McKenna duties and the extension of the Safeguarding of Industries duties. It is understood that they are also raising the question of the reparation due on dyes, although this is a matter outside the scope of the Commercial Treaty.

THE RECORDER OF MANCHESTER, Mr. Greaves-Lord, K.C., speaking on Friday, November 6, on the subject of accidents to workmen, said that the whole law should be coded, and in the codification the Employers' Liability Act of 1880 should be repealed. The defence of common employment and *volenti non fit injuria* should be abolished, and then in all cases where the accident was caused by the negligence of the employer or of some person for whose negligence he was responsible, full damages would be payable, while the sharing of the risk provided for in the Workmen's Compensation Act would remain as it was. The workman would be fully covered where the accident happened through the fault of his master, and would get a partial indemnity even when he himself was partially to blame. This would keep clear the distinction between cases of negligence and cases where there was an absence of blame, and would, in this way, keep alive a real penalty for the negligent employer.

RECENT CHEMICAL TENDERS accepted include—Cement, Cement Marketing Co., £3 4s. 4d. per ton; refined tar, Western Tar Distilleries, London, 6½d. per gallon, both for New Forest Council; lime treatment plant for sewage disposal, Candy Filter Co., £1,952, for Hinckley Council; fuel oil (110 tons), Shell Mex, £5 2s. 6d. (recommended) for Leek Council. Drugs and medicines, etc., to hospitals, etc., in Irish Free State, Evans, Sons, Lescher and Webb, Liverpool, about £12,000 to £15,000 for the half-year. Filter, humus tank, etc., for Cranbrook Council, A. Stanley and Sons, Marden, Kent, £506. Filtration and aeration plant for Deptford Council, Bell Brothers, Ltd., Denton, Manchester, £2,500 (recommended). Electrical vertical centrifugal pump, Worthington-Simpson, Ltd., Kingsway, London, £770 (recommended). Oils, paints, etc., Manchester Paint and Varnish Co., Ltd. Turpentine and turpentine substitute, A. McNair and Co., Ardwick. Methylated spirit, Methylated Spirit Co., Ardwick. Anti-sulphuric enamel, Griffiths Brothers and Co. (London), Ltd. Ciment fondu, Sam Nove, Ltd. Ferrocrete, D. Roberts and Co. (Manchester), Ltd.—all for Manchester Corporation. Cement for Portsmouth Council, Gough's General Distributing Co., Ltd., 43s. per ton.

DR. W. CULLEN and Mr. J. H. Ronaldson are now practising as consulting chemical and mining engineers at 4, Broad Street Place, London, E.C.2.

AN INCORPORATED ASSOCIATION of American stearic acid manufacturers has been formed with headquarters at Cincinnati, and it includes practically the whole industry.

RECENT WILLS include Mr. Haley Davies, engineer and head of E. Davies and Co., Bradford, and an authority on dyestuffs machinery, £14,468; Colonel F. G. Walker, founder and chairman of W. and F. Walker, Ltd., oil manufacturers and merchants, Liverpool, £9,113.

THE GERMAN DYE TRUST is, according to reports, negotiating with the Latvian Government in regard to the erection of a large central store at Riga. The trust intends to work Russia and the Border States from Riga and to accelerate delivery by keeping stores there.

BULLETIN No. 14 has just been issued by the Bureau of Bio-Technology, Murphy and Sons, Ltd., of London, Leeds, and Nottingham. It deals with the fermentation industries, and includes technical articles on the effect of pressure on yeast cells, and P_H values and the use of the comparator in brewing. References to relative iterature are given and detailed tables.

THE THIRD ANNUAL REPORT of the council of the University College, Plymouth, states that the research by the professor of physics has been aided by a special grant of £130 from the Royal Society, and the Chemical Society has made a grant to Dr. Glasstone towards the cost of his investigations on "Solubility Influence." The physics department is badly handicapped by having no research laboratory.

THE ASSOCIATED LEAD MANUFACTURERS, LTD., which controls works at Newcastle-on-Tyne, London, and Liverpool, has recently acquired the Harburger Chemische Werke Schon and Company, A.G., with works situated near Hamburg. The German plant will, for the time being, manufacture lead oxide only. It is being modernised and its capacity considerably increased, as it is intended to supply not only the German market, but also other Northern European markets.

IN ACCORDANCE WITH THE TRUST DEED governing the Harrison Memorial Fund, the Selection Committee will meet shortly to consider the award. The prize, of the value of about £150, is to be awarded to the British chemist of either sex, not over thirty, who, in the opinion of the Selection Committee, during the previous five years, has conducted the most meritorious and promising original investigations in any branch of pure or applied chemistry and published the results of those investigations in a scientific periodical or periodicals. The Selection Committee is prepared to receive applications, nominations, or information as to candidates eligible for the prize, to be sent to the President, The Chemical Society, Burlington House, Piccadilly, London, W.1, by December 1.

AN ARTIFICIAL SILK WORKS is expected to be organised at Huddersfield, utilising a former munition factory. It is expected ultimately to employ 900 workers. The proposed new artificial silk factory at Aintree, the enterprise of the Enka Artificial Silk Co., will eventually employ 3,000 workers and will produce £18,000 worth of artificial silk daily. A few expert workers from existing factories in Holland will be introduced. A new artificial silk company for Manchester is reported with a site at Kendal, and the Branston Works of Crosse and Blackwell have been sold for another factory. Important London financial interests are concerned with Sniga Viscosa, Ltd., an Italian artificial silk undertaking, to the extent of £2,750,000, and a British subsidiary company is to be floated. Spencer Moulton & Co. are to build a large artificial silk factory at Littleborough.

UNIVERSITY NEWS includes the following announcements: Manchester: The resignation has been received of Dr. Henry Stephen, senior lecturer in chemistry, on his appointment to the chair of Chemistry, Witwatersrand University, Johannesburg. Cambridge: Dr. F. H. Constable (biochemistry), has been elected a Fellow of St. John's College. Trinity College offers its annual research studentship for Ph.D. candidates in October, 1926; applications must reach the Senior Tutor by July 25, 1926; also Dominion and Colonial Examinations to next year's students for M.Sc. or Ph.D. degrees, candidates to apply through their own university authorities. London: The degree of D.Sc. (Chemistry) has been conferred on Mrs. E. H. Ingold. Hull: Hull is to have a University College by a gift of £250,000 from Mr. T. R. Ferens. Liverpool: Dr. T. P. Hilditch, chief research chemist to J. Crosfield and Sons, Ltd., of Warrington, has been appointed to the Campbell Brown Chair of Industrial Chemistry (oils, fats, and waxes). Dr. Hilditch, who is the first holder of the chair, entered University College, London, in 1904, graduated with first-class honours in chemistry in 1907, and in 1908 was awarded an 1851 exhibition research scholarship, receiving the degree of D.Sc. in 1911. For several years past, Dr. Hilditch has been engaged in researches in connection with oils and fats.

THE DUNLOP RUBBER CO., according to reports, has now acquired the controlling interest in Charles Macintosh and Co., and subsidiary companies.

MR. R. B. PILCHER, registrar and secretary of the Institute of Chemistry, has been elected vice-president of the Chartered Institute of Secretaries.

MR. F. J. STEPHENS, speaking at Penzance, on Thursday, November 12, stated that a new mining region some five miles in length had been disclosed in the North Cliffs. There were veins of copper, blende, and galena running as much as 64 oz. of silver per ton. One lode carried galena, blende, copper and arsenical pyrites.

THE GERMAN POTASH SYNDICATE has been authorised by its board to float a foreign loan of 40,000,000 dollars and 2,000,000 sterling, representing the first instalment of a total loan of 75,000,000 dollars. The loan is redeemable in 25 years, and will bear interest at the rate of 7 per cent. Interest and redemption are to be guaranteed by monthly reserves accruing from potash sales to America and England.

AN ARTIFICIAL SILK INQUIRY will be undertaken at once by a group of American business men, and a fund of 10,000 dollars is stated to have been raised for the purpose. The object of the inquiry is to collect as much data as possible on artificial silk and artificial silk processes. Particular attention will be paid to the quality of the product yielded by each process, the relative cost, the capital requirements for various sized plants, and the physical requirements for the location of these.

THE NINTH LECTURE of the series "Physics in Industry," given under the auspices of the Institute of Physics, will be delivered by Dr. B. Keen, assistant director of the Rothamsted Experimental Station, and will deal with "The Physicist in Agriculture, with special reference to Soil Problems." The lecture, which will be open to the public, will be given in the rooms of the Chemical Society, Burlington House, London, on Wednesday, November 25, at 5.30 p.m., and the chair will be taken by Sir William Bragg, president.

THE PRESENCE OF POISON in mineral water bottles, is a point raised in the report of the Public Analyst of Walsall. Aerated water, which was said to smell and taste of carbolic acid, did smell strongly of this poison, but the Analyst failed to detect its presence, and the makers stated that they did not use any carbolic acid on their premises. The report adds that "the public are in the habit of using mineral water bottles for the conveyance of all sorts of acids and poisons, and, although all foreign matter can be cleaned off the bottle and stopper, the odour is sometimes retained in the rubber ring of the stopper."

SIR E. OWEN WILLIAMS, in the course of a lecture to the Institute of Civil Engineers, in London, on Wednesday, November 11, said that he had made a series of experiments to determine the influence of the percentage of cement on the qualities of concrete, and came to the conclusion that all properties of concrete varied directly with the percentage of cement in the finished concrete. A 4 : 2 : 1 concrete had approximately 510 lb. of cement per yard cube of concrete, whereas in a 2 : 1 : 1 concrete the cement weight was 860 lb. per yard cube; and if it were reasonable to take 510 lb. per sq. in. compression on a 4 : 2 : 1 concrete the experiment showed that it would be equally reasonable to take 860 lb. compression on a 2 : 1 : 1 concrete. Therefore, there was no ineconomy in rich mixtures—in fact, there was the reverse, whereas a 4 : 2 : 1 mixture was seldom watertight, a 2 : 1 : 1 concrete was seldom not watertight, resulting in increased permanence of construction because of less risk of steel corrosion. The general use of 4 : 2 : 1 mixture, he thought, could only be due to a lack of appreciation of the changed conditions from mass concrete to reinforced concrete.

THE PUBLIC WORKS, Roads, and Transport Congress and Exhibition opened at the Royal Agricultural Hall on Thursday, and continues until November 26. There is a daily conference, each session being allotted to papers arranged by the various bodies, such as the Association of Managers of Sewage Disposal Works and the Institution of Gas Engineers. There is a good showing of road materials and tar products, together with the latest machines for application. Concretes and building materials are also exhibited. Brunner, Mond and Co., Ltd., display a large range of chemicals, and exhibits of the Castner-Kellner Alkali Co. and the Buxton Lime Firms, Ltd., are also shown on their stand. They show also an apparatus that demonstrates the hardening effect of silicate of soda on concrete. Liquid chlorine for treatment of water and sewage is a feature. Hadfields, Ltd., are showing crushing machines and samples of their "Era" manganese steel. W. and J. Glossop show "Preservol," a new tar product, antiseptic, wood preservative. "Colas" is a cold bituminous emulsion, non-poisonous and giving a non-slippery surface by Colas Products, Ltd., London. Baird and Tatlock (London), Ltd., exhibit instruments and laboratory equipment. Cements and allied materials are also prominent.

THE NOBEL PHYSICS PRIZE FOR 1925 has been awarded to Professor Manne Stegbahn, of Upsala.

THE MONSANTO CHEMICAL WORKS have started a plant for the manufacture of paranitraniline. The chlorine plant is expected to be in operation this month.

A SUGAR CONTENT of 20·45 per cent. and 19 per cent. respectively, were given by the analysis of two beet sugar crops grown in Worcester, and this figure, according to expert opinion, will stand comparison with the world's record for sugar.

THE FOLLOWING APPOINTMENTS were made at the meeting of the London Section of the Institute of Chemistry on Wednesday:—Chairman, Sir Robert Robertson, F.R.S.; vice-chairmen, Messrs. E. R. Bolton and R. Leslie Collett; hon. treasurer, Mr. A. J. Chapman; committee, Fellows, Professor G. T. Morgan, Dr. W. R. Ormandy, Messrs. C. E. Barr, E. T. Brewis, W. T. Burgess, Frankland Dent, B. F. Howard, E. B. Hughes, S. J. Johnstone, D. W. Kent-Jones, T. Macara, and P. J. Sageman; associates, Mrs. P. M. Kerridge, Miss S. M. L. Snelus, Messrs. A. V. Hussey, S. A. de Lacy, T. McLachlan, and S. J. Critton.

THE GREAT REDUCTION in fuel consumption as the result of the introduction of gas-making plant was referred to by Mr. Arthur Dorman, of Dorman, Long and Co., in his presidential address to the Cleveland Institute of Engineers, at Middlesbrough on Monday. He said that at one time 10 cwt. to 12 cwt. of fuel was used per ton of steel, but to-day the best furnaces produced a ton on 4 cwt. to 5 cwt. His firm were so impressed by the economies which were possible by the aid of gases that they were determined to make surplus gases their sole fuel, so making it possible for steelworks to be run without using a pound of coal directly for that purpose.

THE POSSIBILITIES OF A NEW INDUSTRY, namely, the manufacture of nitrates and magnesium products, have been revealed by the announcement of the Chemical Metallurgical and Mining Society of South Africa that they have awarded a gold medal to Colonel A. J. Pelling, of Rand University, for a paper dealing with the salt pans of South Africa. Colonel Pelling has separated the salts in Matzap brine in the Hay district of the Cape province, and as a result of his research there is every possibility of opening up a new chemical industry. The proposition is being examined by a prominent overseas chemical manufacturer with a view to starting work in South Africa. Colonel Pelling is a Londoner, and was educated at St. Olaves.

BLACKBURN FIRE BRIGADE dealt with a fire in a warehouse containing chemicals on Saturday, November 14, and had to crawl through heavy fumes to avoid asphyxiation. They were hampered by a thick fog and small explosions, but the flames were eventually subdued. Afterwards the men suffered from violent fits of sneezing. —An explosion at the oil refinery of the Burma Oil Co. near Rangoon last week was followed by the ignition and destruction of 50,000 gallons of oil in a tank. One man working near was killed. —A serious explosion occurred at a fire on Wednesday at the cutlery works of Harrison Fisher and Co., Sheffield. Large stocks of celluloid were involved and it is thought that fumes from this substance were responsible for the explosion which injured three firemen.

THE DANGERS OF NITRIC ACID were the subject of strong comment at the inquest on a woman on Monday at Brislington. The woman bought nitric acid for cleaning some brass work and was warned by the chemist to use it in the open air because of the fumes. Two hours after using the acid the woman developed a cough and later was found gasping for breath. Although a specialist was called and oxygen was administered, she died the next day. Examination showed that her lungs were full of mucous arising from the inhaling of irritant gas, death being due to slow asphyxia. A doctor said it was absurd that nitric acid was in part 5 of the poisons schedule and could be sold by anyone. The jury urged that it should be placed in part 1 or 2 of the schedule and protested against its easy sale.

DR. CHARLES CARPENTER, giving evidence before the Coal Commission in London last week, on behalf of the Gas Companies' Protection Association, spoke of the great anxiety which had been caused by the very large increase in coal costs. The resultant high cost of gas tended to discourage its more general use for gas, heat for heat, except in certain cases, could not compete with raw coal. It could be more economically used than coal and its wider use would free our cities from the smoke menace. A very useful service to the community could be rendered by a careful investigation of the reservation of the various classes of coal for the purposes to which they were best suited. He called attention to the regulations in force with regard to the quality, quantity, and purity of the supply of gas and suggested that, subject to some modifications, similar procedure might be followed with regard to coal.

Obituary

MR. CHARLES ROBERTS, director of the Calico Printers' Association, and vice-chairman of Manchester Chamber of Commerce, on Monday. During the War he was Chairman of the Oils and Fats Association.

References to Current Literature

British

ACIDS.—Studies in the acenaphthene series. Part IV. Aminoacenaphthene-sulphonic acids. G. T. Morgan and V. E. Yarsley. *J.S.C.I.*, November 13, 1925, pp. 513-515T.

AZOXY COMPOUNDS.—The reactions of azoxy compounds. Part I. The action of light. W. M. Cumming and G. S. Ferrier. *Chem. Soc. Trans.*, October, 1925, pp. 2374-2379.

CORROSION.—Corrosion in the works. C. O. Harvey. *J.S.C.I.*, November 13, 1925, pp. 1110-1111.

DYESTUFFS.—A proposed system of tests for the fastness of dyestuffs on wool. H. R. Hirst. *J. Soc. Dyers and Col.*, November, 1925, pp. 347-354.

Colour and molecular geometry. Part IV. Explanation of the colours of the cyanine dyes. J. Moir. *Chem. Soc. Trans.*, October, 1925, pp. 2338-2343.

The composition of some products used for the production of insoluble azo colours. F. M. Rowe and E. Levin. *J. Soc. Dyers and Col.*, November, 1925, pp. 354-356.

OILS.—China wood oil. Part II. M. Toch. *J.S.C.I.*, November 13, 1925, pp. 517-518T.

OPTICALLY ACTIVE COMPOUNDS.—Atomic and molecular asymmetry. J. D. Main Smith. *J.S.C.I.*, November 13, 1925, pp. 1107-1110.

PHOTO-CHEMISTRY.—A new aspect of the photochemical union of hydrogen and chlorine. R. G. W. Norrish. *Chem. Soc. Trans.*, October, 1925, pp. 2316-2334.

RESINS.—The unsaponifiable constituents of commercial rosin, with notes on rosin oil and on the polymerisation of turpentine. E. Knecht and N. B. Maurice. *J. Soc. Dyers and Col.*, November, 1925, pp. 356-361.

RUBBER.—The spraying of rubber latex with protective colloids, particularly glue. W. C. Davey. *J.S.C.I.*, November 13, 1925, pp. 515-517T.

The ultra-violet microscope in the study of vulcanised latex globules. H. Green. *Rubber Age*, November, 1925, pp. 435 437.

TEXTILE TREATMENTS.—The reducing power of waste sulphite liquor and its use in dyeing and bleaching. M. G. Kotibhashker. *J. Soc. Dyers and Col.*, November, 1925, pp. 361-362.

WAXES.—X-rays and the constitution of the hydrocarbons from paraffin wax. S. H. Piper, D. Brown and S. Dyment. *Chem. Soc. Trans.*, October, 1925, pp. 2194-2200.

United States

CHLORATES.—The evaluation of chlorates. E. C. Wagner. *J. Ind. Eng. Chem.*, November, 1925, pp. 1183-1186.

DOUBLE SALTS.—Calcium phosgeno-aluminate. A. F. O Germann and C. R. Timpany. *J. Phys. Chem.*, November, 1925, pp. 1423-1431.

The phosgeno-aluminates of sodium, strontium, and barium. A. F. O. G rmann and D. M. Birosel. *J. Phys. Chem.*, November, 1925, pp. 1469-1476.

FUEL.—Petroleum motor fuel. K. G. Mackenzie. *J. Ind. Eng. Chem.*, November, 1925, pp. 1105-1114.

GERMANIUM.—A revision of the atomic weight of germanium. Part II. The analysis of germanium tetrabromide. G. P. Baxter and W. C. Cooper. *J. Phys. Chem.*, November, 1925, pp. 1364-1378.

OILS.—Catalytic effect of lead and manganese on the drying of China wood oil. G. E. Ludwig. *J. Ind. Chem. Eng.*, November, 1925, pp. 1160-1161.

Evolution of hydrogen peroxide by oils on exposure to light. G. F. A. Stutz, H. A. Nelson and F. C. Schmutz. *J. Ind. Eng. Chem.*, November, 1925, pp. 1138-1141.

SPECTROSCOPY.—The influence of the PH upon the ultra-violet absorption spectra of certain cyclic compounds. W. Stenstrom and M. Reinhard. *J. Phys. Chem.*, November, 1925, pp. 1477-1481.

A precision X-ray spectrometer for chemical investigations. G. L. Clark, H. C. Weber and R. L. Hershey. *J. Ind. Eng. Chem.*, November, 1925, pp. 1147-1150.

SUGAR.—Temperature and analytical changes in sugar liquor during bone black filtration. H. I. Knowles. *J. Ind. Eng. Chem.*, November, 1925, pp. 1151-1153.

Physical examination of sugar juices. K. R. Lindfors. *J. Ind. Eng. Chem.*, November, 1925, pp. 1155-1156.

French

CELLULOID.—The degeneration of celluloid and nitrocellulose collodions. Part II. M. A. Breguet. *Rev. gén. des Colloides.* August, 1925, pp. 230-235.

FERMENTATION.—The reaction of the medium; its *rôle* in the brewery. M. H. Van Laer. *Chim. et Ind.*, October, 1925, pp. 511-518.

HYDROGENATION.—Catalytic hydrogenation under reduced pressure. R. Escourrou. *Chim. et Ind.*, October, 1925, pp. 519-529.

RADIOACTIVITY.—Measurement of radioactivity. C. Matignon and G. Marchal. *Chim. et Ind.*, October, 1925, pp. 503-510.

REACTIONS.—The laws of monomolecular reactions. Fermentation and catalytic reactions. L. Ambard. *J. Chim. Phys.*, October 5, 1925, pp. 402-412.

RUBBER.—The structure of rubber. P. Bary. *Rev. gén. des Colloides*, August, 1925, pp. 225-230.

SULPHATES.—Investigation of the decomposition of metallic sulphates by heat. Part II. G. Marchal. *J. Chim. Phys.*, October 5, 1925, pp. 413-431.

German

ACIDS.—Chemistry of the lead chamber process. F. Raschig. *Z. angew. Chem.*, November 5, 1925, pp. 1001-1010.

Glucuronic acid. F. Ehrlich and K. Rehorst. *Ber.*, October 14, 1925, pp. 1989-1992.

ANALYSIS.—Simple method for the estimation of activin. P. Krais and W. Metes. *Z. angew. Chem.*, November 12, 1925, p. 1045.

A noteworthy behaviour of alkali sulphates in the Kjeldahlisation of nitraniline. B. M. Margosches and E. Scheinost. *Ber.*, October 14, 1925, pp. 2233-2237.

CELLULOSE.—Octa-ethyl-cellubiose and its acetolysis compared with cellubiose and octa-acetyl-cellubiose. K. Hess and G. Salzmann. *Annalen*, October 22, 1925, pp. 111-122.

The constitution of lichenin and cellulose. H. Pringheim, W. Knoll and E. Kasten. *Ber.*, October 14, 1925, pp. 2135-2143.

FOODSTUFFS.—The present-day state of food preservation. K. Scharrer and A. Strobel. *Z. angew. Chem.*, November 12, 1925, pp. 1034-1040.

GENERAL.—The adherence of organic residues. Part III. J. v. Braun, R. Fussgänger and M. Kühn. *Annalen*, October 22, 1925, pp. 201-224.

The temperature of the vapour given off by a solution. E. Reissmann. *Z. angew. Chem.*, November 12, 1925. pp. 1040-1044.

METHYLATION.—Methylation of polysaccharides. L. Schmid. *Ber.*, October 14, 1925, pp. 1963-1965.

PERYLENE COMPOUNDS.—Perylene and its derivatives. Part X. A. Zinke and K. Funke. *Ber.*, October 14, 1925, pp. 2222-2227.

SCRUBBING.—New methods of scrubbing gases. Part IV. G. Weissenberger, F. Schuster and O. Zack. *Z. angew. Chem.*, November 5, 1925, pp. 1010-1013.

Miscellaneous

PHOSPHATIDES.—The isolation of natural crystalline lecithin. H. H. Escher. *Helv. Chim. Acta*, October 1, 1925, pp. 686-691.

PROTEINS.—Halogenated proteins. Part V. Bromocasein. A. J. J. Vandevelde. *Rec. Trav. Chim. Pays-Bas*, October, 1925, pp. 900-906.

REACTIONS.—On Cannizaro's reaction. Part III. C. Endoh. *Rec. Trav. Chim. Pays-Bas*, October, 1925, pp. 866-875.

The action of some chlorine derivatives of carbon dioxide on dimethylaniline. H. Rivier and P. Richard. *Helv. Chim. Acta*, October 1, 1925, pp. 490-500.

SUGARS.—On the formation of *d*-sorbose and *d*-gulose by oxidation of *d*-sorbitol with bromine water. H. W. Talen. *Rec. Trav. Chim. Pays-Bas*, October, 1925, pp. 891-893.

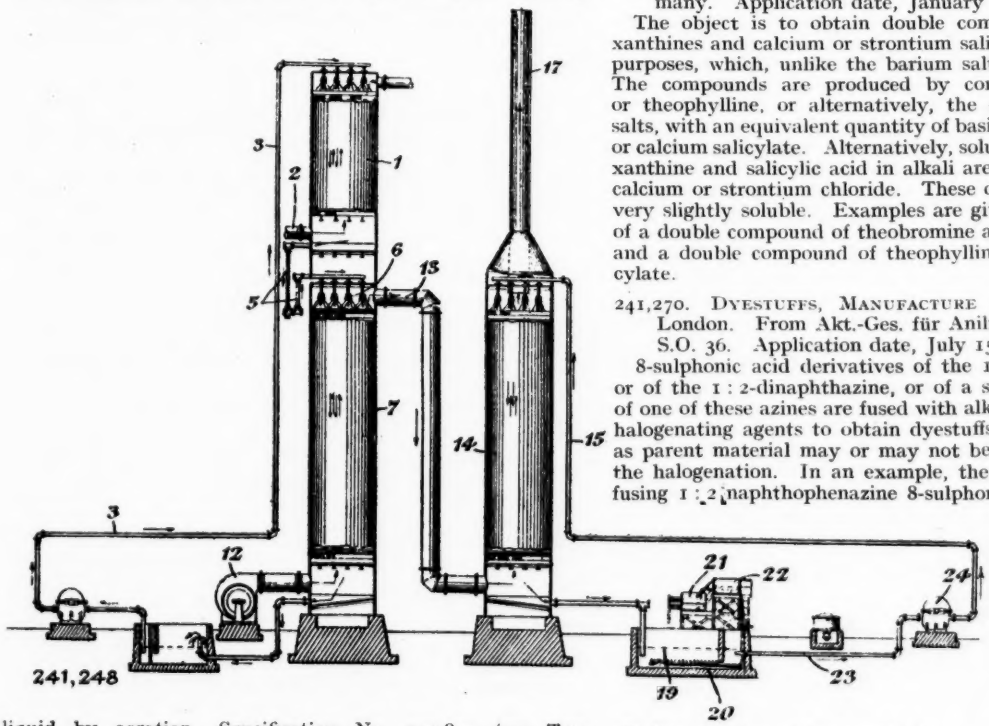
Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Complete Specifications

241,248. Elimination of Hydrogen Sulphide from Fuel Gases such as Coal Gas, Water Gas, and the like, and Air, Processes and Apparatus for. P. C. Rushen, London. From the Koppers Co., 800, Union Trust Building, Pittsburgh, Pa., U.S.A. Application date, June 10, 1924.

Specifications Nos. 169,996 and 170,572 (see The Chemical Age, Vol. V, pp. 710 and 774) describe a process for removing hydrogen sulphide from coal gas and water gas by washing with sodium carbonate solution and regenerating the washing



liquid by aeration. Specification No. 240,891 (see The Chemical Age, Vol. XIII, p. 499) describes the treatment of the stream of air containing hydrogen sulphide with a liquid containing a suspension of an iron compound which absorbs the sulphur, and from which it can be recovered by treating with air. It is found that when only small traces of hydrogen sulphide are present, the natural iron oxide and artificial iron compounds employed are not sufficiently active, and in this invention a cyclic process is employed in which a freshly precipitated iron compound is used, and revivified by oxidation.

The coal gas enters a scrubber 1 at 2 and is treated with sodium carbonate solution supplied through a pipe 3. The solution then passes through a pipe 5 to a set of sprayers 6 in a chamber 7, where it is treated with air supplied by a blower 12. The hydrogen sulphide is transferred to the air, which passes through a pipe 13 to another scrubber 14, where it is treated with a dilute solution of sodium carbonate containing the iron compound in suspension. The purified air escapes through a pipe 17. The liquid passes to the sump 19, where it is further treated with air jets 20, and the liberated sulphur floated off. The purified liquid is circulated through a pipe 23, pump 24, and pipe 15 to the scrubber 14. A tank 21 contains a solution of ferric sulphate, which is run into the sump 19, where it reacts with the sodium carbonate, precipitating ferric carbonate. This freshly formed precipitate reacts with the sodium hydrosulphide in the liquid, producing iron sulphide and sodium carbonate. The iron sulphide is oxidised with air, forming iron oxide. The system is maintained alkaline by adding sodium carbonate. The accumulation of sodium sulphate in the system may be prevented by precipitating the iron compound in a separate tank 22 and decanting the solution.

241,266. Double Compounds of Dimethyl-xanthines, Earth Alkali and Salicylic Acid, Manufacture of. G. M. Clark, London. From Knoll and Co., Chemische Fabrik, 97, Bleichstrasse, Ludwigshafen-on-Rhine, Germany. Application date, January 14, 1924.

The object is to obtain double compounds of dimethyl-xanthines and calcium or strontium salicylate for therapeutic purposes, which, unlike the barium salts, are non-poisonous. The compounds are produced by combining theobromine or theophylline, or alternatively, the calcium or strontium salts, with an equivalent quantity of basic or neutral strontium or calcium salicylate. Alternatively, solutions of the dimethyl-xanthine and salicylic acid in alkali are caused to react with calcium or strontium chloride. These double compounds are very slightly soluble. Examples are given of the production of a double compound of theobromine and calcium salicylate, and a double compound of theophylline and strontium salicylate.

241,270. Dyestuffs, Manufacture of. A. G. Bloxam, London. From Akt.-Ges. für Anilin Fabrikation, Berlin S.O. 36. Application date, July 15, 1924.

8-sulphonic acid derivatives of the 1 : 2-naphthophenazine or of the 1 : 2-dinaphthazine, or of a substitution derivative of one of these azines are fused with alkalis and treated with halogenating agents to obtain dyestuffs. The products used as parent material may or may not be sulphonated prior to the halogenation. In an example, the product obtained by fusing 1 : 2 naphthophenazine 8-sulphonic acid with an alkali is dissolved in nitrobenzene, treated with sulphuryl chloride, and the nitrobenzene steam distilled. A trichloro - derivative is obtained, which gives a blue solution in concentrated sulphuric acid, and a yellow solution in an alkaline solution of hydrosulphite. A similar bromine compound can be obtained, and an example is also given of the production of dyestuffs of from 1 : 2 : 1^1 : 2^1-dinaphthazine-8 : 8^1-disulphonic acid.

241,278. Metallic Catalysts suitable for use in the Manufacture of Synthetic Ammonia, Production of. Technical Research Works, Ltd., and E. J. Lush, 4, Milner Street, London, S.W.3. Application date, July 16, 1924. Addition to 203,218.

Specification No. 203,218 (see The Chemical Age, Vol. IX, p. 377) describes the method of activating metallic surfaces and restoring such activity in spent catalysts by electrolytical anodic oxidation employing a salt of an alkali agent as the electrolyte. Thus the catalyst may be made from iron turnings, oxidised electrolytically in a solution of potassium carbonate or hydroxide. In this invention, the metal catalyst is reduced by hydrogen without removing the alkali salt remaining in it. The catalyst thus consists of a metal containing the absorbed alkali metal salt. A similar treatment can be applied to an alloy of two or more metals.

241,321. Salt, Manufacture of. J. Sheffield, One Ash, Elworth, Sandbach, Cheshire. Application date, August 5, 1924.

Salt formed in a boiler or evaporating pan is continually raked off the sides of the pan and collected in buckets at the

sides. When full, these buckets are conveyed away, and during this time the salt is collected in pockets at the sides of the pan. The buckets return in an inverted position, and in turning to an upright position the accumulated salt is scooped from the pockets into the buckets.

241,329. WHITE LEAD, MANUFACTURE OF. G. F. Lloyd, Coronation Street, Brighton, Victoria, and F. H. Campbell, 35, William Street, Melbourne, Victoria, Australia. Application date, August 8, 1924.

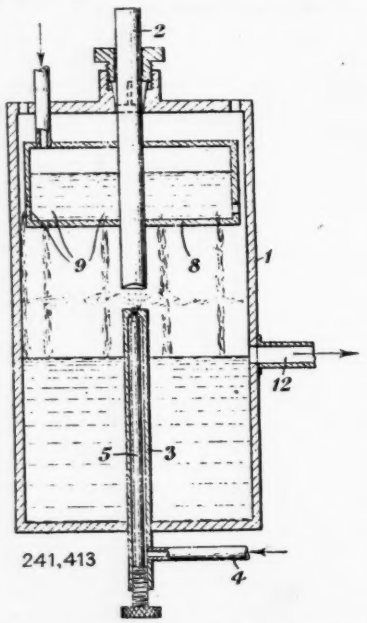
White lead is obtained by reacting on a highly basic sulphate of lead with an aqueous solution of an alkali metal bicarbonate which may or may not contain alkali bicarbonate or carbonate in suspension. The basic lead sulphate may contain 60–75 per cent. of lead hydroxide, and is obtained by the action of concentrated sulphuric acid on lead monoxide in the presence of a small quantity of an acid other than sulphuric acid—*e.g.*, acetic acid, which is capable of forming water-soluble lead salts. A detailed description of the process is given.

241,399. TUNGSTEN ORE TREATED TO OBTAIN TUNGSTEN OXIDE. K. Anjow, 1272, Gongen Dai, Minami, Shinagawa-juku, Shinagawa-machi, Ebara-gun, Tokyo-fu, Japan. Application date, November 13, 1924.

It has been found that when tungsten ore is treated with hot concentrated sulphuric, hydrochloric, or nitric acid, the conversion of the ore into oxide is incomplete. This is due to the formation on the surface of the ore of a coating or film consisting mainly of sulphates, chlorides, or nitrates of iron, manganese, calcium, etc., which are only slightly soluble in concentrated acid. If the ore is very finely ground—*i.e.*, 0·01–0·02 mm., it may be completely converted into the oxide by treating with concentrated or dilute acid. The reaction proceeds more quickly at a higher temperature, and an autoclave may be used. Examples of the treatment of scheelite and wolframite are given.

241,413. NITROGEN COMPOUNDS FROM THE AIR, PROCESS FOR THE EXTRACTION OF. C. Späth, sen., 58, Rheinstrasse, Berlin-Friedenau, Germany. Application date, December 10, 1924.

When water is introduced into an electric arc in regulated quantities, dissociation into hydrogen and oxygen takes place, and the hydrogen atmosphere improves the burning of the arc. Nitrogen compounds are formed, and the presence of



oxygen causes the direct formation of nitric acid. Electrodes 2, 3 extend through a casing 1, electrode 3 being hollow so that water or other suitable liquid can be introduced through a pipe 4. The quantity of water is regulated by a needle valve 5. The water passes into the arc, and is dissociated. Electrode 2 is cooled by a water jacket 8, having outlets 9 through which the water passes on to the wall of the casing 1 to cool it. The sudden cooling prevents a reversal of the reaction, and aqueous nitric acid is driven off through the outlet 12. The formation of nitric acid is assisted by the use of electrodes of cadmium, or an alloy of cadmium and copper containing 20 per cent. cadmium and 80 per cent. copper.

241,435. AZO DYES OF THE PYRAZOLONE SERIES, MANUFACTURE OF. Sandoz Chemical Works, Basle, Switzerland, and M. Böniger, 60, Fabrikstrasse, Basle, Switzerland. Application date, February 7, 1925.

These dyes are obtained by combining a new pyrazolone with diazo compounds. This pyrazolone derives from paradichlorometanilic acid which is obtained by sulphonation of paradichlorobenzene followed by nitration and reduction. By condensing the corresponding paradichlorophenyl-hydrazine-metasulphonic acid with ethyl acetoacetate, the new pyrazolone 1 : 2^1 : 5^1-dichloro-3^1-sulphophenyl-3-methyl-5-pyrazolone is obtained. This compound is coupled with various diazo compounds, yielding azo dyes which give yellow shades on wool which are practically fast to light. Examples of these dyes are given.

241,437. BLACK VAT DYESTUFFS, MANUFACTURE OF. J. Y. Johnson, London. From Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Application date, February 12, 1925.

It has been found that mixtures of dibenzanthrone and nitrodibenzanthrone are suitable for directly producing black dyeings which are fast to chlorine. The proportions employed depend on the special shade required, and on the purity of the dyestuffs. When pure dyestuffs are employed they may be in the proportions of dibenzanthrone 55-90 per cent. and nitrodibenzanthrone 45-10 per cent. The composition may be made by mixing the ingredients or by nitrating dibenzanthrone with nitric acid of a strength insufficient to dissolve the dyestuff while adding substances capable of destroying any nitrous acid formed, such as urea, urea salts, hydrazine hydrate, etc. Other examples are given.

241,452. TREATMENT OF SPENT LIQUIDS FROM GAS PURIFICATION, PROCESS AND APPARATUS FOR. P. C. Rushen, London. From the Koppers Co., 800, Union Trust Building, Pittsburg, Pa., U.S.A. Application date, June 10, 1924.

This process is for oxidising and revivifying the spent liquid containing a sulphide in suspension which is obtained in the elimination of hydrogen sulphide from fuel gases as described in Specification No. 241,248 above. The spent liquid is delivered to a tank containing an atomising device for air, which consists of a box resting on the floor of the tank and having a top consisting of a plate with minute pores. Compressed air is introduced into the box and passes into the liquid in the form of minute bubbles. The porous partition may be formed of "filtros," which is a white natural sand containing 99·6 per cent. silica, bound by a synthetic bonding agent fusing at a temperature above 2,000° F.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—215,334 (E. H. Zollinger) relating to a process for increasing the viscosity of oils, see Vol. XI, p. 45; 218,638 (C. O. Terwilliger), relating to manufacture of synthetic resins, see Vol. XI, p. 270; 221,227 (G. Austerweil), relating to preparation of thymol from *p*-cymene, see Vol. XI, p. 477; 224,907 (G. Grondal and L. Carlson), relating to preparation of oils from shales, schists, coal, or the like, see Vol. XII, p. 86; 231,417 (L. Casale), relating to catalytic synthesis of ammonia, see Vol. XII, p. 563; 235,125-6-7 (Koppers Co.), relating to purification of gases or air, see Vol. XIII, p. 158; 237,575 (Ketoid Co.), relating to manufacture of acetic anhydride, see Vol. XIII, p. 334.

International Specifications not yet Accepted

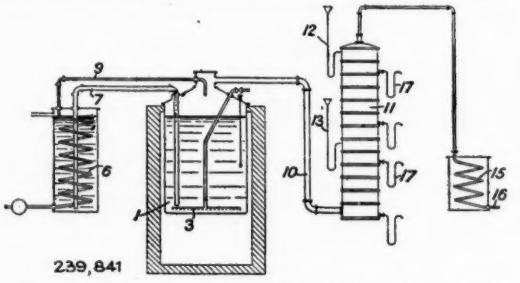
239,846. THIOSULPHATES; PURIFYING GASES. Orkla Grube-Aktiebolag, Lökken Verk, Norway. International Convention date, September 10, 1924.

To obtain thiosulphates, gases containing sulphuretted hydrogen and sulphur dioxide are scrubbed with a solution or suspension of an alkali or alkaline earth hydrate or carbonate. If the gases contain little of the above impurities, but a con-

siderable proportion of carbon dioxide, they are treated with a suspension of finely divided limestone at 60° C. which absorbs completely sulphuretted hydrogen and sulphur dioxide.

239,841. DISTILLING TAR. C. Ab-Der-Halden, Nomexy, Vosges, France. International Convention date, September 13, 1924.

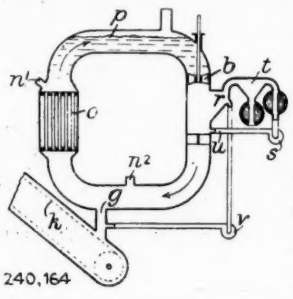
Tar is preheated in a coil 6 and passes through a pipe 9 to a still 1 filled with the residue from distillation, and agitated



by steam or carbon dioxide injected through a device 3. The vapour passes through a pipe 10 to a rectifying column 11, supplied with water, oil, alkaline solutions or other reagents through pipes 12, 13, and condensed fractions are drawn off through pipes 17. Vapour passes to a condenser 16, together with gas injected into the still. Excess of residue from the still 1 passes through pipe 7 to the preheating chamber.

240,164. CRYSTALLIZING. Aktieselskapet Krystal, 26, Uranienborgveien, Oslo. International Convention date, September 17, 1924.

A saturated solution containing suspended crystals is circulated in a closed circuit, and is supersaturated by cooling or by heating and evaporation. Larger crystals are obtained. The saturated solution and crystals are circulated by a propeller *b* through a heater *o* and evaporating chamber *p*. Large crystals pass through the passage *g* to a conveyor *k*, and some solution with small crystals is drawn off to a settling chamber *t* by a pump *s*, the liquid being returned through a pipe *u*. Alternatively, the small crystals may be removed in a filter or centrifugal separator. Fresh solution is added at n^1, and if necessary, small crystals are added at n^2. The heater *o* and evaporating chamber *p* may be replaced by a cooler.



240,168. DYES. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, September 20, 1924.

Pure N-dihydro-anthraquinoneazine is prepared as described in Specification 184,193 (see THE CHEMICAL AGE, Vol. VII, p. 538) and is heated with concentrated sulphuric acid, with or without boric acid. In a modification, crude N-dihydro-anthraquinoneazine is heated with concentrated sulphuric acid and boric acid, then diluted with weaker sulphuric acid, and the product filtered, so that the whole process is effected in a single operation. The product dyes cotton in faster shades than those obtained from the crude N-dihydro-anthraquinoneazine.

LATEST NOTIFICATIONS.

242,583. Process of and apparatus for the extraction of the hydrogen contained in industrial gases and chiefly in coke-oven gas. Soc. Ammonia. November 6, 1924.

242,590. Process for the manufacture of tartaric acid. Chemische Fabrik Dr. H. Stoltzenberg. November 5, 1924.

242,620. Manufacture and production of vat dyestuffs of the isodibenzanthrone series. Badische Anilin- and Soda-Fabrik. November 7, 1924.

242,650. Manufacture of phosphoric acid. W. Kyber. November 7, 1924.

242,669. Process for the manufacture of organic mercury compounds. Farbenfabriken vorm. F. Bayer and Co. November 10, 1924.

Specifications Accepted with Date of Application

226,491. Metal compounds, Process of producing. R. F. Meyerhofer. December 20, 1923.

231,811. Artificial materials, Manufacture of. L. Lilienfeld. April 4, 1924.

232,184. Hydrogen, Apparatus for the manufacture of. Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. April 11, 1924.

237,864. Tricalcium saccharate of high purity, Washing-process for the production of. C. Steffen, jun. July 31, 1924.

239,173. Vulcanisation of caoutchouc. Chemische Fabrik Kalk Ges. and H. Oehme. August 27, 1924.

241,991. Coking retort ovens. P. C. Rushen. (*Koppers Co.*) July 30, 1924.

242,018. Evaporation of solutions of salt or other substances to produce crystals. R. France.. August 23, 1924.

242,020. Extraction, solution, and mixture of soluble and insoluble substances. N. Bendixon, W. E. McKechnie, and E. L. Reid. August 27, 1924.

242,029. Producing oil-gas in externally heated retorts, Process of and apparatus for. J. Rude. September 15, 1924.

242,061. Azo dyes, Manufacture of. British Dyestuffs Corporation, Ltd., K. H. Saunders and H. Goodwin. October 22, 1924.

242,092. Phenols from crude oils, Methods of separating. V. L. Oil Processes, Ltd., O. D. Lucas and E. L. Lomax. November 24, 1924.

242,096. Rubber preservatives. T. W. K. Clarke. December 1, 1924.

Applications for Patents

Akt.-Ges. für Anilin-Fabrikation. Process for decolorising solutions of cellulose derivatives. 28,542. November 12. (Germany, December 23, 1924.)

Associated Lead Manufacturers, Ltd., and Waring, H. Manufacture of oxide of lead. 28,509, 28,510. November 12.

Atkinson, R. H., and Mond Nickel Co., Ltd. Extraction of precious metals from ores, etc. 28,762. November 14.

Badische Anilin and Soda Fabrik, and Johnson, J. Y. Manufacture of iron carbonyl. 28,632. November 13.

Badische Anilin and Soda Fabrik, and Johnson, J. Y. Liquid fuel burners. 28,633. November 13.

Bollmann, H. Treatment of vegetable oils. 28,211. November 9.

Brenek, H., and Rothe, F. Process for transforming barium and strontium sulphates. 28,438. November 11. (Germany, November 12, 1924.)

British Dyestuffs Corporation, Ltd., Mendoza, M., and Saunders, K. H. Azo dyestuffs. 28,639. November 13.

Clavel, R. Treatment of products, etc., containing cellulose derivatives. 28,281, 28,282. November 10.

Czapek, E., Weingand, R., and Wolff and Co. Production of coloured films, etc., from alkali cellulose solutions. 28,420 November 11.

Czapek, E., Weingand, R., and Wolff and Co. Production of film-like bands from solutions of cellulose compounds, gelatine, etc. 28,421. November 11.

Donnelly, J. F. Conversion of hydrocarbon oils. 28,329. November 10. (United States, November 21, 1924.)

Fanshawe, F. W. Dyeing. 28,753. November 14.

Farbenfabriken vorm. F. Bayer and Co. Manufacture of organic mercury compounds. 28,164. November 9. (Germany, November 10, 1924.)

Farbwerke vorm. Meister, Lucius, and Brüning, and Imray, O. Y. Dyeing. 28,416. November 11.

Farbwerke vorm. Meister, Lucius, and Brüning. Preparation of calcium nitrate. 28,415. November 11. (Germany, November 11, 1924.)

Foamite-Childs Corporation, and Foamite Firefoam, Ltd. Fire-extinguishing apparatus. 28,518. November 12.

Gorsky, S. de Procoudine-, and Pozniakow, N. Process for rendering gelatine insoluble, etc. 28,310. November 10. (France, November 19, 1924.)

Grosjean, J. Conversion of hydrocarbons of high boiling point into hydrocarbons of lower boiling point. 28,278. November 10.

Maxted, E. B. Dehydrogenation of organic compounds. 28,607. November 13.

Metal Research Corporation. Reduction of alumina. 28,694. November 13. (United States, December 30, 1924.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Manufacture of boron. 28,185. November 9.

Pickard, J. A., and Hele-Shaw, H. S. Filtration. 28,176. November 9.

Richards, A. A. Dyeing-apparatus. 28,123. November 9.

Silesia Verein Chemischer Fabriken. Preparation of dio-substituted thio-ureas of symmetrical structure. 28,656. November 13. (Germany, December 6, 1924.)

Silica Gel, Ltd. Refrigeration apparatus. 28,775. November 14.

Techno-Chemical Laboratories, Ltd. Oil cracking. 28,547. November 12.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, November 20, 1925.

TRADE has been quite active during the week and orders are now, generally speaking, for larger quantities than has been the case for some time past.

Prices continue more steady, and any movements are usually in the upward direction.

Export trade has also improved, and there are some substantial inquiries in the market.

General Chemicals

ACETONE continues extremely firm and scarce, and is now quoted at from £80 to £82 per ton.

ACID ACETIC is unchanged in value and demand has improved.

ACID FORMIC.—Good business has been placed at the advanced figure of £50 per ton for 85%.

ACID LACTIC is a little more active, and price unchanged at from £43 to £44 per ton for 50% by weight.

ACID OXALIC.—Price well maintained, and business fairly good at 3¾d. per lb.

ALUMINA SULPHATE has been well called for, and is unchanged at £5 10s. per ton for 17/18%.

AMMONIUM CHLORIDE is slow, and inclined to be easy at £19 to £21 per ton.

ARSENIC continues stagnant, but the present nominal price of about £15 per ton for White Cornish can hardly be expected to decline further.

BARIUM CHLORIDE continues firm, and is standing at £8 15s. to £9 per ton.

BLEACHING POWDER is unchanged at British makers' figures.

EPSOM SALTS continue firm at £5 10s. to £5 15s. per ton.

FORMALDEHYDE continues scarce, and is very firm at £43 to £44 per ton.

LEAD ACETATE is moderately active, and is quoted at £45 to £46 for white, and £43 to £44 per ton for brown.

LIME ACETATE maintains its advance, and is quoted at from £17 10s. to £17 15s. per ton.

LITHOPONE unchanged with a fair business passing.

POTASSIUM CARBONATE continues in rather poor demand at £23 10s. for 90/92%.

POTASSIUM CAUSTIC is unchanged.

POTASSIUM CHLORATE is, if anything, a shade easier at 4d. to 4¼d. per lb.

POTASSIUM PERMANGANATE is unchanged, and in good request at 7½d. per lb.

SODIUM ACETATE continues quiet at £17 10s. per ton.

SODIUM BICHROMATE is active, and the quotation is unchanged.

SODIUM HYPOSULPHITE is moderately active at British makers' figures.

SODIUM NITRITE continues in good request, and is quoted at £22 10s. per ton.

SODIUM PRUSSIATE is very firm at 4½d. to 4¾d. per lb.

SODIUM SULPHIDE is weak and uninteresting.

ZINC SULPHATE is unchanged, and in good demand at £14 per ton.

Coal Tar Products

The market generally for coal tar products is steady, with no great change in prices.

90% BENZOL is a shade firmer, and is quoted at 1s. 8d. to 1s. 9d. per gallon on rails.

PURE BENZOL is unchanged, at 1s. 11d. to 2s. per gallon on rails.

CREOSOTE OIL remains unchanged at 6½d. per gallon on rails in the North, while the price in London is about 7½d. per gallon.

CRESYLIC ACID is firm, the pale quality 97/99% being worth about 1s. 8d. per gallon on rails, while the dark quality 95/97% is worth about 1s. 4d. per gallon on rails.

SOLVENT NAPHTHA is firm at 1s. 4½d. per gallon on rails.

HEAVY NAPHTHA is quoted at 1s. 1d. per gallon on rails.

NAPHTHALENES are unchanged, the lower grades being worth from £4 to £4 10s. per ton, the 76/78 quality about £6 per ton, and the 74/76 quality about £5 10s. per ton.

PITCH is in rather better demand, and the market is firmer. To-day's values are 42s. 6d. to 45s. per ton f.o.b. main U.K. ports.

Latest Oil Prices

LONDON.—LINSEED OIL closed easy at 2s. 6d. to 5s. advance; spot, £37 10s.; November and December, £36 5s.; January-April, £36; May-August, £35. RAPE OIL quiet. Crude, crushed, spot, £47 10s.; technical refined, £50 10s. COTTON OIL steady. Refined common edible, £45; Egyptian crude, £39; deodorised, £47. TURPENTINE quiet and 3d. to 6d. per cwt. down. American, spot, 75s. 6d.; December, 76s., and January-April, 77s. 6d.

HULL.—LINSEED. Naked, spot, £37 10s.; November-December, £37 5s.; January-April, £36 10s.; May-August, £35 10s. COTTON OIL. Naked, Bombay crude, £36; Egyptian crude, £37; edible refined, £40; technical, £39. PALM KERNEL OIL. Crushed, naked, 5½ per cent., £43; GROUNDNUT OIL. Crushed/extracted, £45 10s.; deodorised, £49 10s. SOYA OIL. Extracted and crushed, £40; deodorised, £43 10s. RAPE OIL. Extracted and crushed, £47 per ton, net cash terms, ex mill. CASTOR OIL. Pharmaceutical, 54s.; first, 49s.; second, 45s. to 47s. per cwt., net, barrels. COD OIL, 32s. to 33s. for spot, per cwt., barrels.

Nitrogen Products Market

Export.—During the last week the demand has continued from several countries and sales have been made on the basis of £12 5s. per ton, f.o.b. U.K. port in single bags. Higher prices are being quoted for forward periods up to the end of April. There is renewed interest from the Far East and the position both here and abroad points to the maintenance of the higher prices now ruling for forward.

Home.—The home demand is quiet, any substantial increase in demand is not expected until the turn of the year.

Nitrate of Soda.—The nitrate market continues steady at £11 8s. per ton c.i.f. chief European ports. For forward periods higher prices are charged in accordance with position. The move out of nitrate from dealers to consumers at present proceeds quietly.

American Market Movements

(From *Drug and Chemical Markets.*)

BARIUM chloride stronger due to syndicate abroad. Aqua ammonia reaches new low. Nitric acid higher. Acetic acid and acetate of lime higher. Importers of prussiates not offering contracts. General demand good. Increased output of solvent naphtha and xylene anticipated. Benzene in heavy demand. Naphthalene higher. Pyridine steady. Intermediates occupy unchanged position. Para-nitroaniline quoted at varying prices.

A tone of quiet, steady improvement permeates the fine chemical market. The only exception is the rapid advance of quicksilver. Antipyrine and thymol are exceedingly firm and advancing. Activity is reported in formaldehyde. Menthol is lower in price, but scarce.

Linseed oil easier. Chinawood oil steady. Rapeseed oil remains easy. Soya bean oil quiet but firm. Cottonseed oil well supported. Tallow steady. Other animal products quiet.

U.S. Chemical Warfare Developments

MR. H. COONLEY has been appointed chief of the First Chemical Warfare Procurement District and will undertake the mobilisation of industrial plants in his district for the manufacture of gas masks and chemical warfare materials at short notice. There are four similar organisations having headquarters at New York, Pittsburg, Chicago, and San Francisco.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

Acid Acetic, 40% Tech.—£20 per ton.
Acid Boric, Commercial.—Crystal, £40 per ton, Powder, £42 per ton.
Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.
Acid Nitric, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.
Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.
Bleaching Powder.—Spot, £10 10s. d/d; Contract, £8 10s. d/d, 4 ton lots.
Bisulphite of Lime.—£7 10s. per ton, packages extra, returnable.
Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)
Calcium Chlorate (Solid).—£5 12s. 6d. to £5 17s. 6d. per ton d/d, carriage paid.
Copper Sulphate.—£25 to £25 10s. per ton.
Methylated Spirit 64 O.P.—Industrial, 2s. 5d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.
Nickel Sulphate.—£38 per ton d/d.
Nickel Ammonia Sulphate.—£38 per ton d/d.
Potash Caustic.—£30 to £33 per ton.
Potassium Bichromate.—4½d. per lb.
Potassium Chlorate.—3¾d. per lb., ex wharf, London, in cwt. kegs.
Salammoniac.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton. Carr. pd.
Salt Cake.—£3 15s. to £4 per ton d/d. In bulk.
Soda Caustic, Solid.—Spot lots delivered, £15 12s. 6d. to £18 per ton, according to strength; 30s. less for contracts.
Soda Crystals.—£5 to £5 5s. per ton ex railway depots or ports.
Sodium Acetate 97/98%.—£21 per ton.
Sodium Bicarbonate.—£10 10s. per ton, carr. paid.
Sodium Bichromate.—3½d. per lb.
Sodium Bisulphite Powder 60/62%.—£17 per ton for home market, 1-cwt. iron drums included.
Sodium Chlorate.—3d. per lb.
Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool.
Sodium Nitrite 100% basis.—£27 per ton d/d.
Sodium Phosphate, £14 per ton, f.o.r. London, casks free.
Sodium Sulphate (Glauber Salts).—£3 12s. 6d. per ton.
Sodium Sulphide conc. solid. 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. pd.
Sodium Sulphide Crystals.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. pd.
Sodium Sulphite, Pea Crystals.—£14 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—4½d. to 4¾d. per lb. Crude 60's, 1s. 3d. to 1s. 4d. Very poor demand.
Acid Cresylic 97/99.—1s. 5d. to 1s. 7d. per gall. Pale, 95%, 1s. 4d. to 1s. 9d. per gall. Dark, 1s. 3d. to 1s. 6d. per gall. Good demand.
Anthracene Paste 40%.—3d. per unit per cwt.—Nominal price. No business.
Anthracene Oil, Strained.—8½d. per gall. Good inquiry. Unstrained, 7d. to 7½d. per gall.
Benzol.—Crude 65's.—11d. to 1s. 3d. per gall., ex works in tank wagons. Standard Motor, 1s. 8d. to 1s. 10d. per gall., ex works in tank wagons. Pure, 1s. 10½d. to 2s. 3d. per gall., ex works in tank wagons. Firm.
Toluol.—90%, 1s. 8½d. per gall. More inquiry. Pure, 1s. 10½d. to 2s. 2d. per gall.
Xylol Commercial.—1s. 9d. to 2s. 3d. per gall. Pure, 2s. 1d. to 3s. 3d. per gall.
Creosote.—Cresylic, 20/24%, 8½d. per gall. Market very quiet. Standard specification, 6¼d. to 7¼d. per gall.; middle oil, heavy, 6¼d. per gall. Market steady.
Naphtha.—Crude 9½d. per gall. Solvent 90/160, 1s. 4d. to 1s. 10d. per gall. Fair business. Solvent 90/190, 1s. 1d. to 1s. 1½d. per gall. Moderate demand.
Naphthalene Crude.—Drained Creosote Salts, £3 to £4 10s. per ton. Whizzed or hot pressed, £4 to £6. Better inquiry.
Naphthalene.—Crystals and Flaked, £9 to £10 per ton, according to districts.
Pitch.—Medium soft, 36s. to 42s. 6d. per ton, according to district. Moderate demand.
Pyridine.—90/160, 19s. 6d. to 20s. per gall. Firmer. Heavy, 9s. 6d. to 10s. per gall. More inquiry.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.
Acid Amidonaphthol disulpho (1-8-2-4).—10s. 9d. per lb.
Acid Anthranilic.—7s. per lb. 100%.
Acid Benzoic.—1s. 9d. per lb.
Acid Gamma.—9s. per lb.
Acid H.—3s. 6d. per lb. 100% basis d/d.
Acid Naphthionic.—2s. 2d. per lb. 100% basis d/d.
Acid Neville and Winther.—4s. 9d. per lb. 100% basis d/d.
Acid Sulphanilic.—9d. per lb. 100% basis d/d.
Aluminium Chloride, anhydrous.—10d. per lb. d/d.
Aniline Oil.—7d. to 7½d. per lb. naked at works.
Aniline Salts.—7d. to 8d. per lb. naked at works.
Antimony Pentachloride.—1s. per lb. d/d.
Benzaldehyde.—2s. 1½d. per lb. Good home inquiry.
Benzidine Base.—3s. 6d. per lb. 100% basis d/d.
Benzyl Chloride 95%.—1s. 1d. per lb.
p-Chlorphenol.—4s. 3d. per lb. d/d.
p-Chloraniline.—3s. per lb. 100% basis.
o-Cresol 29/31° C.—3d. per lb. Demand quiet.
m-Cresol 98/100%.—2s. 1d. to 2s. 3d. per lb. Demand moderate.
p-Cresol 32/34° C.—2s. 1d. to 2s. 3d. per lb. Demand moderate.
Dichloraniline.—2s. 3d. per lb.
Dichloraniline S. Acid.—2s. 3d. per lb. 100% basis.
Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable.
Dimethylaniline.—2s. per lb. d/d. Drums extra.
Dinitrobenzene.—9d. per lb. naked at works.
Dinitrochlorbenzene.—£84 10s. per ton d/d.
Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 10d. per lb. naked at works.
Diphenylaniline.—2s. 10d. per lb. d/d.
G. Salt.—2s. 2d. per lb. 100% basis d/d.
a-Naphthol.—2s. per lb. d/d. Fair home inquiry.
B-Naphthol.—11d. to 1s. per lb. d/d. Fair home inquiry.
a-Naphthylamine.—1s. 3d. per lb. d/d. Fair home inquiry.
B-Naphthylamine.—3s. 9d. per lb. d/d. Fair home inquiry.
o-Nitraniline.—5s. 9d. per lb.
m-Nitraniline.—3s. 6d. per lb. d/d.
p-Nitraniline.—1s. 11d. per lb. d/d. Fair home inquiry.
Nitrobenzene.—5d. to 5¼d. per lb. naked at works. Good home inquiry.
o-Nitrochlorbenzol.—2s. 3d. per lb. 100% basis d/d.
Nitronaphthalene.—10d. per lb. d/d.
p-Nitrophenol.—1s. 9d. per lb. 100% basis d/d.
p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.
m-Phenylene Diamine.—4s. per lb. d/d.
p-Phenylene Diamine.—9s. 9d. per lb. 100% basis d/d.
R. Salt.—2s. 4d. per lb. 100% basis d/d.
Sodium Naphthionate.—1s. 7½d. to 1s. 8d. per lb. 100% basis d/d.
o-Toluidine.—9d. per lb. Good home inquiry.
p-Toluidine.—2s. 3d. per lb. naked at works.
m-Toluylene Diamine.—4s. per lb. d/d.
m-Xylidine acetate, 2s. 11d. per lb. 100%.

Wood Distillation Products

Acetate of Lime.—Brown £8. Quiet market. Grey, £14 10s. per ton. Liquor, 9d. per gall., 32° Tw.
Acetone.—£73 per ton.
Charcoal.—£7 to £9 per ton, according to grade and locality. Demand fair.
Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall, 24° Tw.
Red Liquor.—10d. to 1s. per gall. 15° Tw.
Wood Creosote.—2s. 7d. per gall. Unrefined.
Wood Naphtha, Miscible.—5s. per gall. 60% O.P. Solvent, 4s. 6d. per gall. 40% O.P. Very quiet.
Wood Tar.—£3 15s. to £5 per ton, according to grade.
Brown Sugar of Lead.—£40 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 7½d. to 1s. 5d. per lb., according to quality, Crimson, 1s. 5d. to 1s. 7½d. per lb., according to quality.
Arsenic Sulphide, Yellow.—2s. per lb.
Barytes.—£3 10s. to £6 15s. per ton, according to quality.
Cadmium Sulphide.—4s. 4d. per lb.
Carbon Bisulphide.—£25 to £28 per ton, according to quantity.
Carbon Black.—5½d. per lb., ex wharf.
Carbon Tetrachloride.—£55 to £60 per ton, according to quantity, drums extra.
Chromium Oxide, Green.—1s. 3d. per lb.
Diphenylguanidine, 4s. to 4s. 3d. per lb.
Indiarubber Substitutes, White and Dark.—5¾d. to 6¼d. per lb.
Lamp Black.—£43 per ton, barrels free.
Lead Hyposulphite.—9d. per lb.
Lithopone, 30%.—£22 10s. per ton.
Mineral Rubber "Rubpron."—£13 12s. 6d. per ton f.o.r. London.
Sulphur.—£9 to £11 per ton, according to quality.

Sulphur Chloride.—4d. per lb., carboys extra.
Sulphur Precip. B.P.—£50 to £55 per ton.
Thiocarbamide.—2s. 6d. to 2s. 9d. per lb.
Thiocarbanilide.—2s. 1d. to 2s. 3d. per lb.
Vermilion, Pale or Deep.—5s. per lb.
Zinc Sulphide.—1s. 1d. per lb.

Pharmaceutical and Photographic Chemicals

Acid, Acetic, 80 % B.P.—£39 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—2s. 6d. to 2s. 8d. per lb. Keen competition continuing. Good demand.
Acid, Benzoic B.P.—2s. to 2s. 3d. per lb., according to quantity.
Acid, Boric B.P.—Crystal £46 per ton, Powder £50 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 4d. per lb., less 5%. Unsettled.
Acid, Gallic.—2s. 9d. per lb. for pure crystal, in cwt. lots.
Acid, Pyrogallic, Crystals.—5s. 6d. per lb. Resublimed 9s.
Acid, Salicylic.—1s. 3d. to 1s. 4d. per lb. Technical.—10½d. to 11d. per lb.
Acid, Tannic B.P.—2s. 10d. per lb.
Acid, Tartaric.—1s. 0½d. per lb., less 5%. Market firm.
Amidol.—6s. 6d. per lb., d/d.
Acetanilide.—1s. 5d. per lb. for quantities.
Amidopyrin.—12s. 6d. per lb.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton. Powder, £39 per ton in 5 cwt. casks.
Atropine Sulphate.—11s. per oz. for English make.
Barbitone.—10s. 3d. per lb.
Benzonaphthol.—3s. 3d. per lb. spot.
Bismuth Carbonate.—12s. 9d. to 14s. 9d. per lb.
Bismuth Citrate.—11s. 4d. to 13s. 4d. per lb.
Bismuth Salicylate.—10s. 2d. to 12s. 2d. per lb.
Bismuth Subnitrate.—10s. 9d. to 12s. 9d. per lb. according to quantity.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 10d. to 2s. per lb.; sodium, 2s. 1d. to 2s. 3d. per lb.; ammonium, 2s. 5d. to 2s. 7d. per lb., all spot. British or Imported. Firm.
Calcium Lactate.—1s. 3½d. to 1s. 6½d. B.P. 1s. 8d. to 2s., according to quantity.
Chloral Hydrate.—3s. 5d. to 3s. 6d. per lb., duty paid.
Chloroform.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.
Creosote Carbonate.—6s. per lb.
Formaldehyde.—£40 per ton, in barrels ex wharf.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 60%, 2s. 6d. per lb.
Guaiacol Carbonate.—6s. to 6s. 6d. per lb.
Hexamine.—2s. 4d. to 2s. 6d. per lb.
Homatropine Hydrobromide.—30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydrogen Peroxide (12 vols.).—1s. 8d. per gallon f.o.r. makers' works, naked.
Hydroquinone.—4s. 4½d. per lb., in cwt. lots.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—1s. 10d. to 2s. 1d. per lb. Green, 2s. 2d. to 2s. 7d. per lb. U.S.P., 1s. 9d. to 2s. per lb. Prices advanced.
Magnesium Carbonate.—Light Commercial, £33 per ton net.
Magnesium Oxide.—Light Commercial, £70 per ton, less 2½%, price reduced; Heavy Commercial, reduced to £23 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d. per lb., according to quantity.
Menthol.—A.B.R. recrystallised B.P., 45s. net per lb., December delivery. Synthetic, 22s. 6d. to 27s. 6d. per lb., according to quality. English make. Very heavy demand.
Mercurials.—Red oxide, 5s. 2d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 7d. to 3s. 9d. per lb; white precipitate, 4s. 6d. to 4s. 8d. per lb.; Calomel, 4s. to 4s. 2d. per lb. Market firmer.
Methyl Salicylate.—1s. 8d. per lb. Demand increasing, price firmer.
Methyl Sulphonal.—16s. 9d. per lb.
Metol.—9s. per lb. British make.
Paraformaldehyde.—1s. 11d. for B.P. quality.
Paraldehyde.—1s. 2d. to 1s. 6d. per lb., according to quantity.
Phenacetin.—4s. to 4s. 3d. per lb.
Phenazone.—6s. to 6s. 3d. per lb. Spot lower than forward price.
Phenolphthalein.—4s. to 4s. 3d. per lb. Supply exceeds demand.
Potassium Bitartrate 99/100% (Cream of Tartar).—80s. per cwt., less 2½% for ton lots. Market very firm.
Potassium Citrate.—1s. 9d. to 2s. per lb.
Potassium Ferricyanide.—1s. 9d. per lb. in cwt. lots. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Steady market.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., spot. Slightly easier.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Steady market.
Resorcin.—3s. 9d. per lb. In fair quantities.
Saccharin.—51s. 5d. to 53s. 8d. per lb., according to quantity. Limited inquiry.
Salol.—3s. per lb.
Silver Proteinate.—12s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—1s. 10d. to 2s. 2d. per lb.
Sodium Citrate, B.P.C., 1911.—1s. 6d. to 1s. 9d. per lb., B.P.C., 1923. 1s. 9d. to 2s. per lb., according to quantity. Advanced.
Sodium Hyposulphite, Photographic.—£14 to £15 per ton, according to quantity, d/d consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 80s. per cwt., according to quantity.
Sodium Salicylate.—Powder, 1s. 11d. to 2s. per lb. Crystal, 2s. to 2s. 2d. per lb. Flake, 2s. 3d. to 2s. 4d. per lb. Very heavy demand.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb.
Sodium Sulphite, anhydrous, £27 10s. to £28 10s. per ton, according to quantity; 1-cwt. kegs included.
Sulphonal.—12s. per lb. Limited demand.
Thymol.—13s. to 15s. per lb.

Perfumery Chemicals

Acetophenone.—9s. per lb.
Aubepine (ex Anethol).—10s. 3d. per lb.
Amyl Acetate.—3s. per lb.
Amyl Butyrate.—6s. 6d. per lb.
Amyl Salicylate.—3s. per lb.
Anethol (M.P. 21/22° C.).—6s. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 4d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 4d. per lb.
Benzaldehyde free from Chlorine.—2s. 9d. per lb.
Benzyl Benzoate.—2s. 9d. per lb.
Cinnamic Aldehyde Natural.—16s. 9d. per lb.
Coumarin.—12s. 3d. per lb.
Citronellol.—16s. per lb.
Citral.—9s. 6d. per lb.
Ethyl Cinnamate.—9s. per lb.
Ethyl Phthalate.—3s. per lb.
Eugenol.—10s. per lb.
Geraniol (Palmarosa).—23s. 6d. per lb.
Geraniol.—8s. to 16s. per lb.
Heliotropine.—6s. 3d. per lb.
Iso Eugenol.—14s. 6d. per lb.
Linalol ex Bois de Rose.—18s. per lb.
Linalyl Acetate.—18s. per lb.
Methyl Anthranilate.—9s. 3d. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ketone.—40s. 6d. per lb.
Musk Xylol.—5s. 9d. per lb.
Nerolin.—4s. per lb.
Phenyl Ethyl Acetate.—14s. per lb.
Phenyl Ethyl Alcohol.—11s. 6d. per lb.
Rhodinol.—36s. 6d. per lb.
Safrol.—1s. 4d. per lb.
Terpineol.—1s. 8d. per lb.
Vanillin.—21s. 6d. to 23s. 6d. per lb. Good demand.

Essential Oils

Almond Oil.—12s. 6d. per lb.
Anise Oil.—3s. 9d. per lb.
Bergamot Oil.—24s. per lb.
Bourbon Geranium Oil.—14s. 3d. per lb.
Camphor Oil.—60s. per cwt.
Cananga Oil, Java.—11s. 3d. per lb.
Cinnamon Oil, Leaf.—5d. per oz.
Cassia Oil, 80/85%.—11s. per lb.
Citronella Oil.—Java, 85/90%, 3s. 7d.; Ceylon, 2s. 4d. per lb.
Clove Oil.—7s. 3d. per lb.
Eucalyptus Oil, 70/75%.—1s. 10d. per lb.
Lavender Oil.—French 38/40% Esters, 28s. per lb.
Lemon Oil.—7s. 6d. per lb.
Lemongrass Oil.—4s. 9d. per lb.
Orange Oil, Sweet.—11s. 3d. per lb.
Otto of Rose Oil.—Bulgarian, 60s. per oz. Anatolian, 35s. per oz.
Palma Rosa Oil.—13s. 6d. per lb.
Peppermint Oil.—Wayne County, 120s.; Japanese, 28s. 9d. per lb. Market excited. Price still rising.
Petitgrain Oil.—9d. per lb.
Sandal Wood Oil.—Mysore, 26s. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, November 20, 1925.

THE heavy chemical market continues fairly satisfactory, good inquiry being received both for home and export. Prices for home products show little change, but Continental offers indicate a firmer tendency in some articles.

Industrial Chemicals

ACID ACETIC.—98/100%, in usual steady demand; 98/100% quoted £55 to £67 per ton according to quality and packing, c.i.f. U.K. port; 80% pure, £40 to £41 per ton; 80% technical, £38 to £39 per ton, packed in casks c.i.f. U.K. ports.

ACID BORIC.—Crystal, granulated, or small flaked, £40 per ton. Powdered, £42 per ton, packed in bags, carriage paid U.K. stations.

ACID CARBOLIC, ICE CRYSTALS.—Rather better inquiry. Now quoted 4½d. per lb. delivered or f.o.b. U.K. ports, but this price could probably be shaded for large quantities.

ACID CITRIC, B.P. CRYSTALS.—Unchanged at about 1s. 3½d. per lb. less 5% ex wharf, inquiry poor.

ACID FORMIC, 85%.—Quoted £46 per ton ex wharf. Prompt shipment from the Continent.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy ex works.

ACID NITRIC, 80°.—Remains unchanged, £23 5s. per ton ex station, full truck loads.

ACID OXALIC, 98/100%.—Spot material unchanged at about 3¾d. per lb. ex store. Offered from the Continent at 3⅝d. per lb. c.i.f. U.K. ports, duty paid.

ACID SULPHURIC.—144°, £6 12s. 6d. per ton; 168°, £7 per ton ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Steady demand and price unchanged at about 11½d. per lb., less 5% ex wharf.

ALUMINA SULPHATE, 17/18%. IRON FREE.—Cheaper quotations from the Continent. Now on offer at about £5 10s. per ton c.i.f. U.K. ports.

ALUM, LUMP POTASH.—On offer from the Continent at £8 per ton c.i.f. U.K. ports. Spot material available at £9 5s. per ton ex store. Powdered quality quoted £7 15s. per ton c.i.f. U.K. ports.

AMMONIA ANHYDROUS.—In moderate demand and price unchanged at 1s. 4½d. per lb. less 5% ex station. Containers extra and returnable.

AMMONIA CARBONATE.—Lump, £37 per ton. Powdered, £39 per ton. Packed in 5 cwt. casks delivered U.K. ports.

AMMONIA LIQUID, 880°.—In usual steady demand and price unchanged at 2½d. to 3d. per lb. delivered according to quantity.

AMMONIA MURIATE.—Grey Galvaniser's Crystals now quoted £27 10s. per ton ex station. Offered from the Continent at about £23 5s. per ton c.i.f. U.K. ports. Fine White Crystals quoted £19 5s. per ton c.i.f. U.K. ports.

ARSENIC, REFINED WHITE CORNISH.—Price remains unchanged at about £18 10s. per ton ex wharf early delivery. Spot material available at about £20 10s. per ton ex store.

BARIUM CHLORIDE.—Large White Crystals quoted £9 per ton ex store, spot delivery. On offer from the Continent at about £7 15s. per ton c.i.f. U.K. ports. Fine White Crystals, £7 5s. per ton c.i.f. U.K. ports.

BLEACHING POWDER.—English material quoted £9 10s. per ton ex station, contracts 20s. per ton less. Offered from the Continent at £8 2s. 6d. per ton c.i.f. U.K. ports.

BARYTES.—English material unchanged at £5 5s. per ton ex works. Continental quoted at £5 per ton c.i.f. U.K. ports.

BORAX.—Granulated, £24 10s. per ton. Crystals, £25 per ton. Powdered, £26 per ton. Carriage paid U.K. stations.

CALCIUM.—English manufacturers' price unchanged at £5 12s. 6d. to £5 17s. 6d. per ton carriage paid to U.K. stations. Continental unchanged at about £3 12s. 6d. per ton c.i.f. U.K. ports.

COPPERAS, GREEN.—In good demand for export. Price unchanged at about £3 7s. 6d. per ton f.o.b. U.K. ports, packed in casks.

COPPER SULPHATE.—In moderate demand for export. Quoted £23 10s. per ton f.o.b. U.K. ports. Continental on offer at about £22 15s. per ton ex wharf.

FORMALDEHYDE, 40 %.—Offered from the Continent at about £39 10s. per ton c.i.f. U.K. ports. Spot material available at £41 per ton ex store.

GLAUBER SALTS.—English material unchanged at £4 per ton ex store or station. Continental on offer at about £3 per ton c.i.f. U.K. ports.

LEAD, RED.—Imported material on offer at £44 per ton, ex store.

LEAD, WHITE.—Quoted £44 10s. per ton, ex store, spot delivery. On offer from the continent at about £43 per ton, ex wharf.

LEAD ACETATE.—Quoted £43 15s. per ton c.i.f. U.K. ports, prompt shipment from the continent. On offer at about £45 10s. per ton, ex store, for spot delivery.

MAGNESITE, GROUND CALCINED.—In moderate demand and price unchanged at about £8 15s. per ton, ex station.

POTASH CAUSTIC, 88/92%.—Syndicate prices vary from £25 10s. to £28 15s. per ton, c.i.f. U.K. ports, according to quantity and destination. Spot material available at about £29 per ton, ex store.

POTASSIUM BICHROMATE.—Unchanged at 4½d. per lb. delivered.

POTASSIUM CARBONATE 96/98%.—Quoted £25 15s. per ton, c.i.f. U.K. ports. Prompt shipment from the continent. Spot material available at about £26 15s. per ton, ex store.

POTASSIUM CHLORATE 98/100%.—Offered from the continent at £30 per ton, c.i.f. U.K. port for powdered, £32 10s. crystals. Only small quantities available for near delivery.

POTASSIUM NITRATE, SALTPETRE.—99% refined granulated quoted £24 15s. per ton, c.i.f. U.K. ports. Spot material available at about £27 5s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Spot material quoted 8d. per lb., ex store. Offered for early delivery at 7½d. per lb., ex wharf.

POTASSIUM PRUSSIATE, YELLOW.—In good demand. Now quoted 7½d. per lb., ex wharf, prompt shipment from the continent. Spot material advanced to about 7¾d. per lb., ex store.

SODA CAUSTIC.—76/77%, £17 10s. per ton; 70/72%, £16 2s. 6d. per ton. Broken 60%, £16 12s. 6d. per ton. Powdered, 98/99%, £20 17s. 6d. per ton. All carriage paid U.K. stations, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—On offer at about £18 5s. per ton, ex store, spot delivery. Quoted £17 15s. per ton, c.i.f. U.K. ports, prompt shipment.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—English price unchanged at 3½d. per lb., delivered.

SODIUM CARBONATE, SODA CRYSTALS.—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality, £1 7s. 6d. per ton more; alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture unchanged at £9 10s. per ton, ex station, minimum ton lots. Pea crystals, £14 per ton, ex station. Continental commercial quality quoted £9 5s. per ton, ex store.

SODIUM NITRATE.—Quoted £13 per ton, ex store. 95/98% refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE, 100%.—Quoted £24 per ton, ex store. Offered from the continent about £22 5s. per ton, c.i.f. U.K. ports.

SODIUM PRUSSIATE, YELLOW.—Still in good demand and price for spot material now about 4¼d. per lb., ex store. On offer from the continent at 4⅛d. per lb., ex wharf.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption, £3 10s. per ton, f.o.r. works. Good inquiry for export and higher prices obtainable.

SODIUM SULPHIDE.—English material. Solid 60/62%. Now £13 per ton. Broken, £14 per ton. Flake, £15 per ton. Crystals, £8 10s. per ton. Carriage paid U.K. stations, minimum 4 ton lots, with slight reductions for contracts to the end of the year. 60/62% solid offered from the continent at £10 15s. per ton c.i.f. U.K. ports. Broken £1 per ton more. 30/32% crystals, £7 15s. per ton, c.i.f. U.K. ports.

SULPHUR.—Flowers, £10 10s.; roll, £9 10s.; rock, £9 7s. 6d. ground, £9 5s. per ton, ex store, spot delivery. Prices nominal.

ZINC CHLORIDE 98/100%.—Quoted £23 per ton, c.i.f. U.K. ports, prompt shipment from the continent. English material 96/98% quoted £23 15s. per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Of continental manufacture on offer at about £11 15s. per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZALDEHYDE.—2s. 2d. per lb. Fair home inquiries.

ALPHA NAPHTHYLAMINE.—2s. to 2s. 1d. per lb. Some home enquiries.

PICRAMINATE OF SODA.—2s. 3d. per lb. Some home inquiries.

BENZIDINE BASE.—3s. 6d. per lb. Some home inquiries.

DIMETHYLANILINE.—2s. per lb. Some home inquiries.

The Manchester Chemical Market

(From Our Own Correspondent.)

Manchester, November 20, 1925.

A fair volume of business has been reported on the Manchester chemical market this week. Most of the transactions are for spot delivery of small or medium parcels, although contract bookings for next year in several lines are said to have been good. A feature of the market is the continued weakness of arsenic, prices again being substantially lower. With this exception price changes since last week have not been important, although weakness is apparent in more than one item. Speaking generally, however, values are keeping up pretty well.

Heavy Chemicals

A quiet demand for chlorate of soda is being met with and at 2¾d. per lb. quotations are about unchanged from last report. Sulphide of sodium is in moderate request at £11 15s. per ton for 60-65 per cent. concentrated solid and £9 10s. per ton for commercial quality. Prussiate of soda is steady at round 4d. per lb., but demand is not very pressing. Caustic soda is selling in fair quantities both on home consumption account and for shipment; values are maintained at from £15 12s. 6d. per ton for 60 per cent. strength to £18 for 76-77 per cent. material. Soda crystals are unaltered at £5 5s. per ton and a quietly steady demand is being met with. Hyposulphite of soda is still offering at about £14 5s. per ton for photographic crystals and £9 for commercial quality; inquiry for this product is rather slow. Bleaching powder is in moderate request and prices are unchanged from last week at round £9 per ton. Saltcake is steady at £3 12s. 6d. per ton, with business on a restricted scale. Glauber salts are selling slowly at round £3 10s. per ton. Phosphate of soda continues in quiet demand at £12 5s. to £12 10s. per ton. A fair amount of business in alkali is being done and values are held at £6 15s. per ton. Acetate of soda is rather quiet at £17 10s. per ton. Bicarbonate of soda meets with a quietly steady demand, with quotations still round £10 10s. per ton. Bichromate of soda is quiet and easy at 3½d. per lb.

Carbonate of potash continues to meet with a moderate amount of inquiry, and prices are maintained at £25 to £25 10s. per ton. Caustic potash, however, is not very active; 90 per cent. strength is still quoted at £27 per ton. Yellow prussiate of potash is steady at round 7¼d. per lb., with business on a moderate scale. Chlorate of potash is still about 4d. per lb., but demand is not particularly active. Permanganate of potash is rather slow, though no change in values since last report is to be recorded; pharmaceutical quality is quoted at 7½d. to 7¾d. per lb., and commercial material at about 6d. Bichromate of potash is rather slow at 4½d. per lb.

No improvement in the position of arsenic can yet be reported and values are weaker again, white powdered, Cornish makes, being no better than £15 per ton on rails. Sulphate of copper is in fair request and prices are steady at £24 to £24 10s. per ton. Nitrate of lead is unchanged in value at £41 to £41 10s. per ton, a quiet demand being met with. Acetate of lead is steady at £44 to £45 for white material and round £40 per ton for brown; demand is only moderate. Acetate of lime is firm and in fair request at £15 to £15 10s. per ton for grey and about £8 for brown. Epsom salts are on offer at about £3 15s. per ton; magnesium sulphate, B.P. quality, is easy at £4 15s. per ton.

Acid and Coal-Tar Products

A fair demand for acetic acid is being experienced, and prices are steady at about £38 per ton for 80 per cent. commercial quality and £66 to £67 for glacial. Oxalic acid is quiet, and prices are a shade easier at 3⅞d. to 3¾d. per lb. Citric acid is rather slow at last week's level of 1s. 3½d. per lb. Tartaric acid is only in limited demand at about 11½d. per lb.

Coal tar products are not particularly active in any section. Pitch continues slow though nominally unchanged at about 40s. per ton. Carbolic acid is arousing very little buying interest and prices are weak, crystals at 4¼d. per lb., and crude material at 1s. 3d. to 1s. 4d. per gallon. Creosote oil is still quoted at round 6d. per gallon. Crude naphthalene is in fair demand at from £4 5s. per ton, with refined rather quiet at £12 to £13. Solvent naphtha is moderate at about 1s. 5½d. per gallon.

Flow Meter Developments

In the course of a lecture delivered before the Junior Institution of Engineers on November 6 on the subject of "Flow Meters," Mr. W. H. Simmons, A.I.C., described a type known as the Rotameter, which has come into prominence recently. The instrument consists of a vertical transparent tube tapering towards the lower end and containing a float, which is kept suspended by the upper flow of liquid or gas which is being measured. The height of the float in the tube indicates directly on a scale marked on the tube the rate of flow. There are several grooves on the outside of the float, so that the stream of liquid or gas keeps it in rapid rotation.

Mr. Simmons said that the Rotameter was accurate to within 2 per cent., due to the fact that it was entirely frictionless. There was no wear or deterioration over long periods. Rotameters were used in many industrial processes, for instance, for the control of air in the bio-aeration method of sewage disposal, for the control of chlorine for water purification, and for many purposes in gasworks. It was used also for the mixing of gases in correct proportions. In the discussion which followed, questions were asked regarding distant recording and integrating venturi meters, and meters for measuring a pulsating flow.

Charcoal Manufacturer's Failure

Statutory first meetings in the case of Hadfields Chemical Works, Ltd., Albion Chambers, Small Street, Bristol, were held in London last week under a winding-up order. A statement disclosed ranking liabilities of £5,182 and net assets £2,808. The paid-up capital was £21,002, and the total deficiency as regards contributories was £25,595. The company in May, 1920, acquired the business of animal charcoal manufacturers carried on by Makin and Bancroft, Ltd., at Weston, Lancs, under the style of Hadfields Charcoal Works Co. Up to March, 1921, the company did well with animal charcoal, which was sold to English sugar refiners at remunerative prices. When the sugar trade was de-controlled in 1921 the refiners then ceased buying from the company because they could buy more cheaply abroad. The works were closed in December, 1922, and from that time onwards stock had been gradually disposed of. The failure was attributed to foreign competition, decreased demand for charcoal from English sugar refiners, and reduction of export trade.

The liquidation was left in the hands of the Official Receiver.

Memorial to Sir James Dewar

The Duke of Northumberland, as president, on Thursday, November 12, unveiled a memorial on the staircase of the Royal Institution, London, to the memory of the late Sir James Dewar, in recognition of his great services to science and as director of the institution. The memorial consists of a bronze plaque portrait of Sir James Dewar in profile, by Sir Bertram MacKennal. The Duke of Northumberland accepted the memorial in the name of the Royal Institution, and said that the memorial would prove a source of encouragement to all who followed his footsteps in the great cause for which Sir James Dewar lived. Sir J. J. Thomson (Master of Trinity College, Cambridge) eulogised the work of Sir James, and said that he used to perform in public experiments so difficult that very few could have carried them out successfully even in a laboratory. He was the real discoverer of liquefied gases as a physical agent; the vacuum flask was also invented by him. His discovery of the method of producing high vacua by means of charcoal cooled by liquid gases had done more for the progress of modern science than any other discovery.

Oil Tank Explosion Report

The official report upon the explosion of a new oil tank at the works of the Medway Oil and Storage Co., Ltd., Isle of Grain, Kent, in January, in which three men were killed and five injured, states that there is little doubt the explosion was due to the ignition of petrol vapour, present with the air in the space at the top of the tank, and that the ignition was produced by a heated rivet, which was about to be inserted in a hole near the top of the tank. The petrol entered the tank with the water used for testing purposes, because the same pump and pump-line were used for both petrol and water.

Company News

A. B. FLEMING AND CO.—An interim dividend of 5 per cent. (actual) is announced.

ALLEN-LIVERSEDGE AND CO.—A dividend is announced at the rate of 6½ per cent. per annum for the six months ended October 31 on the preference shares.

DORMAN, LONG AND CO.—The payment of the half-yearly dividend on the cumulative preference shares is recommended, but the directors do not recommend an interim dividend on the 8 per cent. preferred ordinary or on the ordinary shares.

CASSEL CYANIDE CO.—A final payment of 6d. per share, making 9d. per share for the year ended September 30 is recommended. It is proposed that this dividend be paid on December 10 to all shareholders on the register on November 13.

BROKEN HILL PROPRIETARY (BLOCK 14) CO., LTD.—It is reported from Melbourne that the declaration of a dividend and the payment of interest on the preference shares has been deferred entirely owing to the suspension of the smelters' contract due to the shipping strike.

EASTMAN KODAK OF NEW JERSEY.—The directors have declared the following dividends, payable on January 2: Regular dividend of 1½ per cent. on the preferred shares; regular dividend of $1.25 per share on the common shares; extra dividend of $0.75 per share on the common shares.

SANTA CATALINA NITRATE CO.—The gross profit for the year ended June 30 last amounted to £18,718, as compared with £23,227 for the preceding year. After deducting London expenses and depreciation of investments, the net profit comes to £16,168 in contrast with £21,099 a year ago.

AMALGAMATED ZINC (DE BAVAY'S).—The report for the half year ended June 30 last states that the gross profit on working account was £1,011. Including £19,256 for dividends on shares in other companies, and £6,087 representing interest earned, etc., the net profit was £21,255, which, added to the credit balance brought in of £21,816, made available £43,071. After payment of the thirty-seventh dividend, a balance is carried forward of £18,071.

LONDON NITRATE CO., LTD.—The directors propose to pay a final dividend of 3s. 6d. per share, free of tax, making with the interim dividend paid in May last, a total distribution for the year ended June 30 last of 5s. per share, free of tax. This compares with a total of 4s. per share, tax free, for the previous 12 months. The directors also propose to transfer £50,000 to the reserve for the redemption of debentures (same as last year), and carry forward £11,887, as compared with £11,992 brought in.

BRITISH DYESTUFFS CORPORATION, LTD.—The accounts for the 17 months ended March 31, 1925, reveal a profit of £88,674, which is arrived at after providing £437,832 for depreciation. A loss of £449,276 was brought forward, and, after allowing for the above profit, there remains an adverse balance of £360,602. The report states that the trading results have been adversely affected by the fall in prices of foodstuffs and increased competition in the home market, although the colour-using trades show some improvement, and in recent months there has been an increasing demand for the company's products. Substantial improvement has been made during the period under review both in the quality and range of colours marketed by the company, and substantial economies have been effected in the cost of manufacture. The subsidiary companies in which the company was interested having been liquidated, the assets of these companies have been transferrred to the company and the necessary changes made in the form of the balance-sheet. After providing £360,025 for depreciation and crediting the final amount recoverable in respect of E.P.D., the report for the preceding period of 12 months showed a profit of £251,423, thereby reducing the debit balance of £700,699 brought in to £449,276.

Filtration Plant, etc., for Waterworks

THE name and address of a firm of responsible and experienced engineers, able to undertake an important contract for filtration plant and accessories for waterworks, is required by a Glasgow company.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to December 18, 1925.

"RUSTICOFF."

461,829. For a chemical substance used as priming for metals. Murphy and Son, Ltd., The Cedars, Sheen Lane, Mortlake, London, S.W.14; technical chemists. September 1, 1925.

"MOTYL."

462,663. For chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. Class 1, Badische Anilin and Soda Fabrik (a Joint Stock Company organised under the laws of Germany), Friesenheimerstrasse, Ludwigshafen-on-Rhine, Germany; manufacturers of alizarine, aniline dyes, artificial indigo and chemicals. September 25, 1925. (To be Associated. Sect. 24.)

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CHEMICALS, COLOURS, ETC.—A firm of manufacturers' agents in Sydney wish to represent British manufacturers of chemical products, colours, and artificial silk. (Ref. No. 397.)

BITUMINOUS PAINTS, RED LEAD, ETC. An agency firm in Stockholm wishes to represent British manufacturers of bituminous paints, red lead (dry and mixed with oil), oxide of iron, dry colours for paint manufacture, asbestos and products thereof, non-ferrous metals in ingots, pig iron, china clay, tin plates and grindstones natural, not artificial.

THE DIRECTOR of Government Medical Supplies, Amsterdam, is inviting tenders, on behalf of the Department of War, for the supply of medicinal preparations, including acetone; acetic, boric, sulphuric, and other acids, liquid ammonia, Peruvian balsam, glycerin, gum arabic, seed oils, etc., etc., and also soft soap. Tenders to the Director of the Government Medical Supply Stores, Amsterdam, by December 1.

Tariff Changes

AUSTRIA.—Salvarsan, neosalvarsan and salvarsan compounds and certain chemical uniform substances used exclusively for medical purposes are now free from import duty.

FRANCE.—The following are amended classifications:—Liquid resin, etc., obtained from the manufacture of cellulose pulp, as indigenous resinous products, "gemmes," crude resins (No. 115), clayey residues from the metallurgical treatment of aluminium (more than 20 per cent. aluminium), as aluminium waste (No. 203) (less than 20 per cent.), same duties as copper waste.

GUATEMALA.—Reductions in import duties are—caustic potash and carbonate of potash, impure, for soap making; silicate of soda, caustic soda, salted or impure for soap making, now all 1 ct. per kilog (from 10, 5, and 5 cts. per kilog respectively).

Plant for Handling Barytes

A MINING firm in Yorkshire is anxious to communicate with manufacturers of chemical plant for dealing with barytes from its crude state to the washed, bleached and ground product.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BRENTFORD ELECTRO CHEMICAL WORKS, 234A, High Street, Brentford. (C.C., 21/11/25.) £27 5s. 10d. October 7.

STANSFIELD, J. L., 54, Boothfold, Waterfoot, chemical manufacturer. (C.C., 21/11/25.) £11 9s. 10d. October 15.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

JACKSON (THOMAS S.) AND SONS, LTD., Mitcham, varnish manufacturers. (M., 21/11/25.) Registered November 9, £3,000 debentures; charged on Corner Wharf, Malt Street, Camberwell, also general charge. *£5,000. May 13, 1924.

LAUTARO NITRATE CO., LTD., London, E.C. (M., 21/11/25.) Registered November 7, £1,500,000 1st (Antofagasta) debenture stock with liberty to company to redeem at 102 per cent. on and after December 1, 1932, on giving six months' notice (secured by Trust Deed dated October 22, 1925). Present issue £1,000,000; a first charge on eight nitrate oficinas, etc., and a second charge (subject to previous debenture stock), on 16 other nitrate oficinas, etc., Antofagasta, with buildings, plant, etc., also to be secured by local mortgages, executed in Chile. *£1,500,000. July 10, 1925.

Receivership

SOCLEAN, LTD. (R., 21/11/25.) S. W. Dixon, of 25, Shaftesbury Avenue, W., was appointed receiver on November 4, 1925, under powers contained in first and second debentures dated November 1, 1924, and October 19, 1925, respectively.

London Gazette, &c.

Company Winding Up Voluntarily

SOUTHDOWN CHEMICAL CO., LTD. (C.W.U.V., 21/11/25.) R. M. Coutts, 3, St. James' Square, Manchester, chartered accountant, appointed liquidator November 6. Meeting of creditors at the liquidator's offices on Monday, November 23, at 12 noon.

Bankruptcy Information

ALLEN, Percy Thomas, 122, Whirlowdale Road, Sheffield, chemical engineer. (R.O., 21/11/25.) Receiving order, November 7. Debtor's petition. First meeting November 26, 11.30 a.m., Official Receiver's Offices, Figtree Lane, Sheffield. Public examination, December 10, 2 p.m., County Court Hall, Bank Street, Sheffield.

PICKLES, R. H. AND CO., Manganese Mills, Droylsden, Lancs, chemical manufacturers. (R.O., 21/11/25.) Receiving order, November 10. Creditor's petition.

New Companies Registered

AMOID MANUFACTURING CO., LTD., Farley Lane, Hucknall, Notts. Manufacturing and retail chemists, druggists, drysalters, etc. Nominal capital, £3,000 in £1 shares.

T. A. BOOTH (IDLE), LTD., chemists, druggists, drysalters, oil and colourmen, etc. Nominal capital, £2,000 in £1 shares. Solicitor: J. L. Windle, 9, Market Street, Bradford.

EXPLOSIVES INDUSTRIES, LTD., 82, Victoria Street, London, S.W.1. Manufacturers of and dealers in explosives, gunpowder, blasting powder, ammunition and chemical manufacturers, etc. Nominal capital, £10,000 in £1 shares.

GRIP-PHALT, LTD., 18, Ironmonger, London, E.C.4. To acquire any interests in patents relating to the manufacture and preparation of bitumen emulsion known as "Amoa Coldphalte" and products thereof, and the emulsification of bitumen, etc., compounds used for the making and maintenance of roads. Nominal capital £15,000 in 14,000 7 per cent. participating preference shares of £1, and 20,000 ordinary shares of 1s. each.

Carbon Dioxide in Ship Holds

THERE have been several cases recently of serious accidents arising from injurious gases in the holds of unventilated ships, and the Department of Scientific and Industrial Research has now issued a special report, No. 24, under the Food Investigation Board, by Mr. A. J. Smith, Low Temperature Research Station, Cambridge, price 9d. net.

The reports state that carbon dioxide gas leaks in considerable amounts from ships' holds carrying fruit overseas, and that if the leakage is too small a dangerous amount of carbon dioxide may accumulate in a hold where no deliberate ventilation is given. Direct leakage tests were made on two vessels with "unventilated" holds and carbon dioxide gas was introduced into the empty holds. The rate of leakage was considerable, but was markedly less than had been postulated as occurring in fruit-carrying holds at sea. The mean leakage values were 3,500 and 1,350 cu. ft. of air per day respectively. A leakage of 10,000 cu. ft. per day had been postulated as necessary for the safe carriage of fruit in such holds.

The rate of leakage in port was increased to more than ten times its original value by opening the thermometer tubes, but there was only a small increase in leakage brought about by completely opening up the lower hold booby hatch. Leakage occurred mainly by the hatches, but to some extent also by ventilating plugs. Gas passed freely by the bilge limbers into the bilge, but did not appear to escape further in this direction. No evidence had been obtained of the passage of gas through the metal plates of the bulkheads or decks.

The leakage was due in part to diffusion through the actual material of the hatch plugs and more particularly to the "mass movement" of air through the crevices between the plugs. The increased leakage which occurred when the thermometer caps were removed, and the increased leakage postulated as occurring at sea, were undoubtedly mass movement effects.

Wembley Exhibition Sales

A LARGE amount of the remaining property at the British Empire Exhibition, Wembley, is being sold by public tender, and it is announced by International Tenders, Ltd., of 146, Bishopsgate, E.C.2, that many large commercial concerns have preferred this method of disposal to that of auction. Among the scrap materials offered are ferro-concrete columns, ceilings and floor slabs, breeze concrete slab partitions, fibrous plaster, deal framing and doors, sheet glass, electric fittings and cables. The sale is also announced of 10 tons of bronze ingots, of approximately 15-20 per cent. tin and 2 per cent. lead, tenders (on the company's official form) to reach the company's offices not later than 3 p.m. on Monday, November 23.